Public Goods and Private Interests: The Role of Voluntary Green Power Demand in Achieving Environmental Improvements

by

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Abstract

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This dissertation explores the role of consumer purchasing behavior in providing public, environmental goods. It does so by empirically evaluating one market – voluntary demand for renewable energy. The dissertation addresses the following five research questions: (1) What does early experience with green power marketing tell us about the prospects for this market to deliver environmental benefits? (2) What product design and marketing approaches might be used to increase voluntary demand? (3) What motivates non-residential customers to voluntarily purchase green power? (4) What role might public policy play in the creation of the green power market? (5) What preferences do individuals hold on the most appropriate forms of support for renewable energy?

By helping to answer these questions, this dissertation seeks to better understand the gap between widespread positive attitudes for the environment and an often-anemic response to green product offerings. It contributes to not only the public goods and environmental marketing literatures, but also to contingent valuation methodology and to an emerging literature on the motivations of firms to contribute to environmental causes.

The analysis performed is diverse, and includes: a literature review, a mail survey of green power marketers, a mail survey of non-residential green power customers, and contingent valuation and opinion surveys of U.S. residents. Detailed statistical analysis is performed on the data collected from the residential and non-residential surveys.

The analysis reveals that customer participation in green power programs to date has been weak. The possibility that the traditional economic concept of "free riding" may explain this low response is raised, and the dissertation identifies a number of marketing approaches that might be used to partially combat this problem. Analysis of survey data shows that non-residential green power purchases have been motivated principally by altruistic concerns; this finding differs substantially from the extant literature on firm motivations to pursue environmental initiatives. Meanwhile, a mail survey of marketers illustrates the importance of policy in stimulating the green power market. Finally, responses to contingent valuation and opinion surveys show that U.S. residents prefer collective payments for renewable energy over voluntary programs.

Overall, this analysis presents a more nuanced understanding of the "green" market than traditionally offered by neoclassical economics and environmental marketing. Some evidence of free riding is found, but this work also identifies other barriers to the development of the green market. The study concludes that green power marketing may increase renewables supply, but that traditional public policy supports should not be abandoned in the hope that customer-driven markets will take up the slack.

Professor Richard Norgaard, Chair — Date

To Maureen and Lindsey Wiser,

with love.

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In the course of my dissertation research, I have been encouraged to publish relevant findings. Chapter 2 of this dissertation was published in the journal *Energy and Environment.* Special thanks to Mark Bolinger and Ed Holt, both of whom have been a joy to work with over the years. Chapter 3, meanwhile, was published in *Utilities Policy*, and special thanks go to Steven Pickle as well as to a host of reviewers of the original draft of the paper: Ralph Cavanagh, Brent Haddad, Benjamin Hobbs, Richard Howarth, Rudd Mayer, Terry Peterson, Kevin Porter, Nancy Rader, Tom Rawls, and Steve Wiel. Chapter 4 was published in *Energy Policy*, and I have Meredith Fowlie and Ed Holt to thank for their collaboration and friendship. Chapter 5 is derived from a journal article published in *Renewable and Sustainable Energy Reviews*, and I would particularly like to thank the numerous green marketers that contributed their time and survey responses. Chapter 6 of this dissertation was the hardest to complete, methodologically and financially. Thanks especially to Richard Norgaard for helping to guide this work, Tim Beatty for collaborating on the work throughout and providing much of the statistical genius, and Chuck Goldman and Joe Eto for supporting the completion of this work through Berkeley Lab.

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Chapter 1

Introduction

1.1 Research Objectives

People are continually bombarded with environmental messages: purchase this "green" product; buy recycled paper and organic food; invest in socially responsible companies; recycle your newspaper and plastics; conserve energy; carpool and use mass transit. Businesses are also beginning to hear these environmental pleas, and governments are increasingly relying on voluntary agreements, ecolabeling, and information policy to encourage industry to lessen its environmental footprint (Segerson and Miceli 1998).[1]

These environmental pleas and voluntary programs reflect, in part, an increased emphasis on the power of individuals and businesses to voluntarily alter buying patterns, behaviors, habits, and manufacturing processes to promote environmental improvements. They also reflect a belief by some that government regulations, mandates, and incentives may not be sufficient to meet the public's desire for a cleaner environment.

But how successful can such voluntary actions and product purchases really be in providing what is essentially a public, or collective good in environmental improvement? This dissertation examines one market, the customer-driven market for green power

[1] There are over a dozen U.S. Environmental Protection Agency (EPA) programs that are based on voluntary agreements, ecolabeling, awards, or information policy. The EPA's Energy Star and 33/50 programs are but two examples of these programs. The Energy Star program certifies energy efficient equipment and buildings, while the 33/50 program encourages voluntary reductions in toxic emissions through information and reporting requirements.

among households and businesses, to better understand the role of voluntary consumer actions and product purchases in providing public, environmental goods.

Certain electricity customers in the United States have had the opportunity to voluntarily purchase, and typically pay a premium for, green power since 1993. Green power is defined here as electricity that contains a substantial amount of renewable electricity: solar, wind, geothermal, biomass, and hydropower. As with other green product markets and voluntary environmental programs before it, substantial debate has centered on the potential role and impacts of this market relative to more traditional forms of collective, public policy support for renewable electricity. Some have heralded the green power market as offering a substantial new opportunity to bring renewable energy into the mainstream (Nakarado 1996) and perhaps to even replace the need for public policy incentives for renewable generation (Bohi and Montgomery 1997). Others remain skeptical, concerned that voluntary demand should not be counted on to provide public benefits (Rader and Norgaard 1996), that marketers have an incentive to "greenwash" their product offerings (Rader 1998), and that public policy efforts to support renewable energy should take strong precedence over voluntary purchases.

The central question posed by this dissertation is whether, to what extent, and under what conditions voluntary demand for green power among households and businesses can contribute to the provision of public environmental goods. Rather than seeking direct answers to the philosophically tinged question of the "appropriate role" of such voluntary consumer action, however, this dissertation has a more modest aim. In particular, using a somewhat eclectic mix of approaches, I seek answers to the following (more) specific research questions, each of which is addressed in a separate chapter of this dissertation:

1) What does early experience with green power marketing tell us about the prospects for this market to deliver public, environmental benefits?
2) Using public goods theory as a guide, what product design and marketing approaches might be used to increase voluntary demand for renewable electricity?
3) What motivates non-residential (business, governmental, and non-profit) customers to voluntarily purchase and pay a premium for green power?
4) What role might public policy play in the creation of a green power market, and what specific policies would do the most to stimulate voluntary customer demand?
5) What preferences do individuals hold on the different ways of supporting renewable energy, and where does voluntary green power demand fit in this preference order?

In addition to a review of relevant literatures and secondary data sources, the primary data for this dissertation come from a series of mail surveys: (1) a small sample survey of green power marketers to explore policy preferences; (2) a survey of business, governmental, and non-profit organizations already purchasing green power to understand purchase motivations; and (3) national contingent valuation and opinion surveys of U.S. households to explore preferences for how to support renewable energy. A variety of statistical procedures are used to analyze the data collected.

Before describing the results of my analysis, Section 1.2 of this introductory chapter briefly reviews relevant literature on the contribution of voluntary actions to the provision of environmental goods. Section 1.3 introduces the green power case in more detail and offers justification for its selection as the primary research case for this dissertation. Section 1.4 describes the research approach and methods used to address each of the research questions listed above, and outlines the remainder of the dissertation.

1.2 Summary Literature Review and Contributions

1.2.1 Public Goods Theory and the Limits of Volunteerism

Traditional neoclassical economic theory largely dismisses the role of individuals or businesses in making sizable un-coerced commitments to environmental improvements. For a public good to be provided at an economically efficient level, the sum of all individual marginal valuations of the good (e.g., the marginal social benefit) should equal its marginal cost. But, while individuals might value public goods and be willing to pay for them *collectively*, the theory of public goods – as formalized by Olson (1965) and Samuelson (1954)[2] – shows that it is frequently not in one's individual interest to *voluntarily* provide public goods, such as environmental improvements, whose benefits cannot be captured solely by those who contribute and that are instead available for all to enjoy. In such circumstances, individuals (who are assumed to maximize their own well being) have strong incentives to not contribute towards public goods, and to instead take a "free ride" and enjoy the benefits of the public good provided by others

[2] Though formalized by Olson and Samuelson, it should be noted that earlier work by Aristotle, Smith, Mill, Sax, Lindahl and others recognized the basic problem of collective action.

while avoiding payment. While some individuals may still voluntarily contribute towards public goods,[3] additional levels of public goods provision (even where the collective benefits outweigh the costs) will go un-provided. A "pareto optimal" level of public goods provision is therefore typically deemed impossible through such decentralized funding mechanisms, and government action to ensure the collective provision of public goods is often warranted.

Combine this with the limited cognitive abilities of humans to understand the environmental implications of their behaviors (Menell 1995, Beales et al. 1981) and the possibility of "greenwashing" (Roper Starch Worldwide 1996, Carlson et al. 1995, Polonsky 1995, Kangun et al. 1991, Fierdman 1991), and the potential for voluntary consumer action to deliver sizable environmental benefits (including through the purchase of green power) would appear bleak. Because of these limitations, and because it is often in the *collective* interest to support some degree of environmental gains, the public goods theory has provided a traditional rationale for government intervention in markets to ensure a healthy environment. Only through government intervention or other social institutions, it is commonly thought, can the market failure be overcome and a socially desirable amount of public goods be provided.

1.2.2 The Limits of Public Goods Theory

Despite economic theory, however, practical experience shows that the voluntary provision of environmental goods does in fact occur, at least to some degree. Millions of

[3] Contributions may come from those for whom the public benefits have such a significant value that the incremental value of public goods provision to the individual outweigh the individual's cost to contribute.

American households recycle their newspapers, plastics, and cans on a weekly basis (Ackerman 1997). Thirteen percent of professionally managed financial investments are screened based on social criteria (www.socialinvest.org). A growing number of households opt to purchase consumer products that are labeled as "green" or "environmentally friendly," even when sold at a premium (Ottman 1998, Hall et al. 1989). In 1996, 8.9% of all consumer products introduced were positioned as green (Green Business Letter 1997), and surveys reveal that a large number of individuals either reward or intend to reward firms that address environmental concerns in their business and marketing practices (Roper Organization 1992, Vandermerwe and Oliff 1990, Ottman 1998, Speer 1997).

Moreover, governments the world over have begun to rely on voluntary pollution prevention programs to encourage environmental improvements in industry, and a number of large businesses have been active participants in these programs, including those run by the U.S. EPA (Videras and Alberini 2000). A practitioner-oriented literature on environmental marketing, which emphasizes the potential size and profitability of the green consumer market, has even developed to help firms and others understand how to take advantage of this market (see Ottman 1998, Wasik 1996, and Menon and Menon 1997 for overviews of this literature). More broadly, local sports venues, churches, parks and other facilities and programs that are partially funded through voluntary payments are just a few examples that seem to contravene the hypothesis that decentralized and voluntary provision of public goods is impossible.

While the environmental benefits of these voluntary actions are arguably not yet significant relative to the power of government regulation, and some harbor significant doubts about the potential for such voluntary environmental actions (Eden 1996, Purcell and Keil 1990), these actions do have some impact. This, in turn, has spawned increased academic attention as researchers have sought some explanation for why certain individuals[4] and firms[5] voluntarily contribute to such causes despite apparent economic incentives to the contrary.

More generally, the pervasiveness of the free-rider problem has been questioned on academic grounds, and the degree and conditions under which individuals actually do voluntarily contribute to public goods has become the subject of a great deal of theoretical, experimental, and field research in economics, political science, sociology, and psychology.[6] As described in more detail in Chapter 3, this work has used game theory, experimental economics, and field research to critique the formal version of the public goods theory (Davis and Holt 1993, Ostrom 1990, Ostrom 1998). Other studies have also directly questioned the behavioral assumptions underlying the traditional public goods theory, and have attempted to account for empirical and experimental evidence of voluntary contributions to public goods by developing new models of public goods provision. These include models based on (1) multiple preference orderings (Margolis 1982), (2) assurance games and reciprocity (Sugden 1984), and (3) impure altruism in which public goods provision offers both public and private benefits (Andreoni 1990, Cornes and Sandler 1996). While most would not seriously contend that voluntary action can fully and “optimally” provide public, collective goods, and most recognize the

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[4] See Granzin and Olson (1991) and Schwepker and Cornwell (1991) for reviews of this literature.
[5] See, for example, Arora and Cason (1996), Arora and Gangopadhyay (1995), Welch, Mazur and Bretschneider (2000), and Henriques and Sadorsky (1996).
[6] Two collections of essays encompassing the range of perspectives in this general debate are Friedman (1996) and Hogarth and Reder (1986).

continued need for government intervention in environmental matters, nor would many of these academics immediately dismiss the possible influence of voluntary individual action in providing certain environmental benefits.

1.2.3 Research Contributions

Whether one is or is not a strong believer in the ability of voluntary action to hasten environmental improvements, however, it has become increasingly clear that there is often a wide disconnect between the stated environmental preferences (and even purchase intentions) of consumers and their actions (Smith and Haugtvedt 1995, Richie and McDougall 1985, Rose et al. 1997, Kempton 1993). Based on data from 1996, for example, 50% of adults in the U.S. are concerned about the level of pesticide residue on food products, while only 18% say they look for food that is pesticide free and just 2% of overall produce sales are organic (Hartman Group 1996). It is also true that some "green" products and behaviors fare much better than others, though little research has been done to explore the determinants of the "success" or "failure" of different green product markets (Kempton 1993). Whether and to what extent free riding affects customer response to green product offerings, relative to other factors, is also unclear.

In addressing the research questions identified in Section 1.1 and focusing on the green power case, this dissertation seeks to better understand the reasons for the gap between environmental attitudes and behaviors; as will become clear later in the dissertation, the economic concept of free riding is just one of several possible explanations for the gap. In so doing, this dissertation builds upon and contributes not only to the public goods and environmental marketing literatures, but also to literatures that address the role of government intervention in markets and the motivations of individuals and firms to voluntarily contribute to environmental goods. It is hoped that this research will result in a more nuanced understanding of the "green" market than that typically offered by either the neoclassical economic or environmental marketing literatures. Further, through the contingent valuation study reported in Chapter 6, this research adds to the literature on stated preferences and environmental valuation. Finally, with policymakers struggling to decide how to support renewable energy in the future, by examining one proposal – the green power market – the research findings presented here have timely policy implications.

1.3 The Green Power Case

To provide some context for my later analysis, here I introduce renewable electricity, historic approaches used to promote renewable generation, and the green power case. I also offer justification for my selection of green power as a central research topic.

1.3.1 What is Renewable Electricity?

Renewable energy sources are typically defined to include wind, solar, biomass, geothermal, and hydropower. Text Box 1-1 provides further detail on the nature of these energy sources. To summarize, renewable energy represents a diverse array of fuels and conversion technologies, whose common characteristic is that the fuel is replenished over a relatively short time horizon. Because of this characteristic, renewable energy resources

Text Box 1-1. Renewable Energy Technology Summary

For a more in depth review of renewable energy technologies and economics than that given below, see DOE and EPRI (1997), OTA (1995), Johansson et al. (1993), WEC (1994), Williams and Bateman (1995), SERI (1990), and Gipe (1991).

Solar: There are two basic ways to convert direct solar energy into electricity: solar thermal power plants and photovoltaics (PV). Photovoltaics convert sunlight directly into electricity via solid-state electronics and semiconductors. PV technology has improved significantly and costs have declined, but PV systems still are quite costly, often 20¢/kWh or more. While the other renewable resources often serve the bulk power market, absent subsidies, PV systems are typically only economic in off-grid or other niche applications. Solar thermal electric plants use various types of mirrors (central receiver, parabolic trough, and parabolic dish) to concentrate sunlight on a receiver that holds a heat transfer fluid. That fluid can then be used to generate electricity. New solar thermal plants may have costs as low as 7-8¢/kWh.

Biomass: To generate electricity, biomass can be cofired with coal, separately burned in steam plants, or gasified to power gas turbines, fuel cells, or internal combustion engines. Biomass residues are often burned by the forest products and agricultural industries in traditional steam turbines to generate process steam and electricity. By far, this represents the largest component of biomass electricity use. Another significant source of biomass generated electricity comes from recovered methane from landfills. Over the longer term, it is possible that dedicated bioenergy crops and gasification technologies will be used, but these technologies are not yet cost competitive. The more traditional forms of biomass electricity generally cost between 5¢/kWh and 8¢/kWh.

Wind: Wind turbines extract the kinetic energy of the wind to generate electricity, and wind power is one of the more economic renewable resources. In certain areas of the United States, wind power today represents one of the least-cost electricity generation sources, with costs as low as 3 cents/kWh. Modern wind turbine technology is relatively mature, with high availabilities, though capacity factors average 30-40% given the intermittent nature of the wind resource.

Geothermal: Geothermal power plants extract heat from the earth (remaining from the original formation of the earth or generated from the decay of radioactive isotopes). Hydrothermal fluids provide the only commercial resource, and generation technologies range from direct steam to binary systems. Geothermal development is geographically constrained to certain areas with high-quality hydrothermal resources. The cost of geothermal electricity in good sites ranges from approximately 4¢/kWh to 7¢/kWh.

Hydropower: Hydropower is the most common renewable resource, and extracts the energy flowing in water to turn a turbine and generate electricity. Though certainly renewable, hydropower is often treated separately from the other renewable technologies because: (1) it is a mature technology and is typically cost competitive with other forms of generation; and (2) the environmental footprint of a hydropower facility is frequently larger than that of other renewable resources.

are virtually inexhaustible over time. Contrast this with fossil fuels, which are essentially stock-limited resources that are replenished only over long time scales.

1.3.2 Markets for Renewable Energy

Of the renewable energy sources, only hydropower is used on a large scale in the United States, representing 8.6% of total net electricity generation in the nation. Other forms of renewable electricity contribute just 2.1%. Of this 2.1%, approximately 72.2% comes from biomass, 21.1% from geothermal, 5.6% from wind, and 1.1% from solar. Table 1-1 summarizes these data. Because hydropower is a mature energy technology with low costs and with its own negative environmental impacts, this paper focuses largely on the non-hydro renewable energy technologies: solar, wind, geothermal, and biomass.

During the 1980s and early 1990s, much of the non-hydropower renewable energy development in the Unites States, and in the world, occurred in California. In recent years, however, increased development has occurred in other regions of the United States (e.g., Texas, the Midwest and the Northwest) and in Europe. Due to its relatively low cost among the renewable technologies, the wind power industry has experienced particularly significant growth recently, with an average annual growth rate of 32% since 1995.

Table 1-1. Electricity Production Fuel Mix in the United States, 1999

Generation Resource	Percent of Mix
Coal and Oil	53 percent
Nuclear	20 percent
Natural Gas	16 percent
Hydroelectricity	9 percent
Other Renewable Energy	2 percent
biomass	1.5 percent
geothermal	0.4 percent
wind	0.1 percent
solar	0.02 percent

Source: http://www.eia.doe.gov/cneaf/electricity/epav2/epav2t1.txt

1.3.3 The Benefits of Renewable Energy

Electricity production from utilities accounts for 26% of our nation's nitrogen oxide emissions, 64% of sulfur dioxide, 33% of mercury, and 36% of anthropogenic greenhouse gas emissions (EPA 1997a, 1997b, 1999). These emissions exacerbate asthma and respiratory disease, regional haze and smog, acid rain related damages, and global climate change. Electricity production, transmission, and distribution also negatively affect our water, land, and wildlife, and can raise levels of harmful radiation. The majority of these impacts come from fossil and nuclear plants; many of the renewable energy sources emit little if any pollutants and their impacts on the environment are generally much smaller and more localized than those of fossil and nuclear facilities. The public benefits provided by renewable electricity supply are therefore primarily environmental ones (see, e.g., Hohmeyer 1998, Ottinger et al. 1990, Serchuk 2000), though the advantages of energy independence, reduced price volatility (Hoff and Herig 1996), and increased economic development and employment (Clemmer 2001) are also frequently mentioned (Nogee et al. 1999).

One note on the public environmental benefits offered by renewable electricity is in order. All forms of electricity production create environmental insults. The advantages that certain renewable electricity projects provide is by offsetting the use of more polluting forms of electricity production. Therefore, it is not that renewable electricity directly provides public, environmental improvements. On the contrary, it is by backing down other generation sources that these benefits are delivered.[7]

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[7] While it should be clear that renewable electricity generation can supply public environmental benefits by offsetting more polluting forms of production, I should acknowledge that green power marketing may or

1.3.4 Historic Forms of Support

Other than hydropower, most forms of renewable electricity supply have historically had higher costs than traditional fossil supplies. While cost reductions over the last 20 years have been substantial, and today some forms of renewable generation can complete on par with fossil generation, many renewable electricity applications remain higher cost than their alternatives.[8] In addition, significant institutional barriers continue to thwart the increased use of renewable energy (Jackson 1992, NRRI 1994, Hamrin and Rader 1993, Alderfer et al. 2000, Nogee et al. 1999).

Consequently, public policy incentives and mandates have largely driven the renewable electricity market since the 1970s in both the United States and abroad (Kozloff and Dower 1993, OTA 1995, Hamrin and Rader 1993). These policies have included tax incentives, cash payments, renewables set-asides, standardized contracts, low-interest loans, and environmental adders (Rader and Wiser 1999, Rahm 1993, Larson and Rogers 2000). While these policies have not all performed as well as expected (Lotker 1991, Wiser and Pickle 1998, Cox *et al*. 1991, Mitchell 1995) and their influence has ebbed and flowed with the political tides, these collective efforts to support renewable energy have been critical for the development of the renewable industries. It was a consequence of these incentives that many of the modern renewable energy industries were born in California

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may not itself provide a significant level of public goods, a point to which I return in Chapter 2. In particular, if green power providers decide to market products that claim but do not deliver incremental environmental improvement, few benefits will be achieved from green power demand.

[8] Modern wind power plants can cost 3-6 cents/kWh, biomass 5-8 cents/kWh, geothermal 4-7 cents/kWh, and solar 20-50 cents/kWh. New natural gas fired power plants can cost as little as 3 cents/kWh, depending on fuel costs.

during the 1980s. It must be noted, however, that despite these historic forms of support, the overall contribution of renewables supply to domestic electricity production remains low.

As electricity restructuring took hold in the mid to late 1990s, renewable energy development initially slowed in the United States as uncertainty enveloped the electricity market and as concerns arose that renewable energy would fare poorly in these competitive markets (Rosen et al. 1995, Hamrin et al. 1994, Wiser et al. 1998). As a consequence of restructuring, however, a large number of individual states have renewed and increased their commitment to renewable energy resources through renewables portfolio standard (RPS) and system benefits charge (SBC) policies (Wiser et al. 2000). The RPS requires retail electricity suppliers to meet a certain percentage of their electricity demand with eligible renewable energy sources (Rader and Norgaard 1996, Rader and Hempling 2001, Wiser and Langniss 2001). The SBC represents a non-bypassable charge on all electricity bills to collect funds for, among other things, renewable energy (Bolinger et al. 2001). It is in part a result of this re-invigorated state commitment that renewable energy development, and especially wind development, increased dramatically beginning in 2000.

1.3.5 Customer Choice and Green Power

Though public policy measures have driven the renewable energy market historically, the concept of using voluntary customer demand to support renewable energy has received an increasing amount of academic and policy attention since the mid 1990s. At least some of this interest derives from market research that shows that a significant percentage of households state that they are willing to pay more for renewable energy. Green power marketing targets this apparent demand to purchase, and even pay a premium for, renewable electricity. Though most (perhaps all) supporters of renewable energy do not believe that voluntary green power markets can substitute for strong public policy, there is a range of opinion on the scope of the role that green power demand might play relative to more traditional forms of policy support.

Until recently, the U.S. electric industry was treated as a natural monopoly and was regulated as such (Kahn 1971, Joskow and Schmalensee 1983, Berg and Tschirart 1995). Regulated electric utilities have historically been charged with providing a commodity product to their ratepayers at least cost and with high reliability. While some product and service differentiation existed, it has typically been limited (Hirsh 1989). As described in more detail in Chapter 2, however, in 1993 the first utilities began to offer green pricing programs.[9] Under these programs, regulated utilities offer their ratepayers the ability to pay a small premium to support the supply of renewable electricity (Moskovitz 1993). As of late-2001, 80 utilities across the United States, serving approximately 20% of the American population, offered such programs.

Meanwhile, a number of states have restructured their electricity industries in the hope of spurring competition and offering customers a range of new products and services. Under restructuring, electricity customers are, for the first time, given the opportunity to purchase their electricity from a number of competing suppliers. Though the fate of this type of electricity reform remains in doubt given the 2000-2001 electricity crisis in California, where competition has been allowed a new breed of electricity supplier – the green power marketer – has entered the market to offer renewable energy to end-use customers, typically at a premium. Unlike the utility green pricing programs

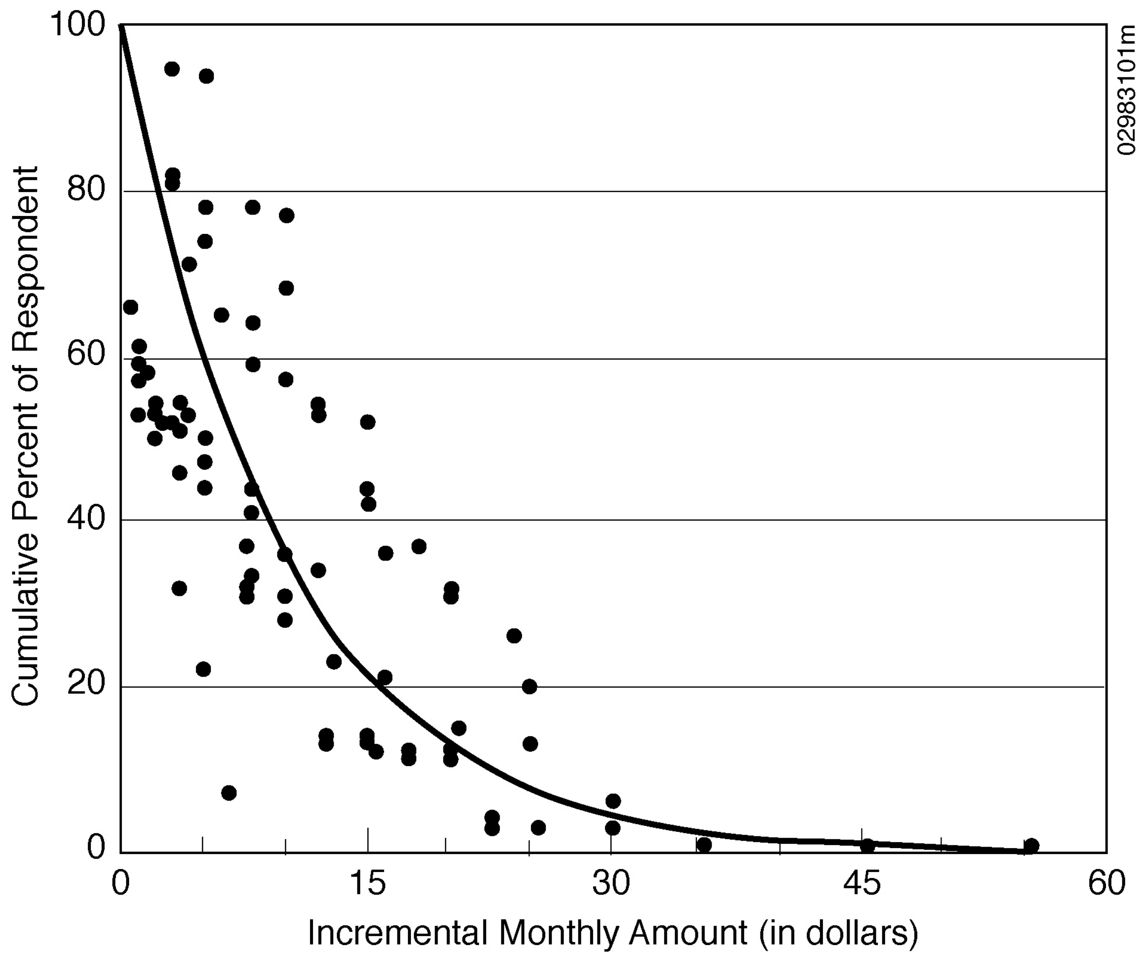
[9] Even before this time, customer-sited renewable generation was available to end-use customers. Though this market (primarily one that involves photovoltaics) is part of the broader green power market, this dissertation does not cover customer-sited generation. Instead, I emphasize green power offerings based on utility-scale renewable energy plants located remotely from the customer.

described above, under restructuring customers may have a range of green power options from which to choose.

1.3.6 The Willingness to Pay "Gap"

Attitudinal surveys typically overestimate actual market response and, for a variety of reasons, should not be taken as a true indication of demand on either a collective or individual basis (Rose *et al.* 1997). Nonetheless, as already reported, market research shows that substantial numbers of U.S. households state they are willing to pay a bit more for renewable energy (Farhar 1994, Farhar 1999). Figure 1-1 aggregates the results of a number of these studies to construct a "willingness to pay curve" showing the percent of residential customers that indicate a willingness to pay for renewable energy at different premium payment levels. As shown, an average of 70% of respondents indicate a willingness to pay a $5 monthly premium, dropping to 20% at a $15 monthly premium.

This market research data suggests a potentially large green power market, but opinion surveys that pose hypothetical payment questions frequently overestimate response to actual product offers. To better estimate actual response to a product offer, market simulations or field studies are frequently employed. In these studies, individuals are presented with a real opportunity to purchase green power over the phone or via the mail. Four publicly available studies of this type have been performed, each of which focuses on residential customer demand for green power. These studies generally demonstrate that a smaller percentage of residential customers – from as low as 5% to as high as nearly 50% – actually purchase green power when confronted with a real offer in a research setting (see Text Box 1-2 for summaries).



Source: Farhar (1999)

Figure 1-1. Aggregated Willingness to Pay for Renewable Energy

Actual marketing efforts to date have achieved even lower penetrations. As reported in Chapter 2, among the 40% of the U.S. population that has access to one or more green power products, as of mid 2001 less than 1% had purchased green power.

Thus, despite the high expectations raised by market research and even market simulations, the reality of both regulated and restructured markets is that green power market penetration is still low. Also evident, however, is that the current 1% market penetration is not an upper bound for household participation rates. Instead, field studies

Text Box 1-2. Summary of Green Power Market Simulations

Niagara Mohawk
Cornell University researchers conducted a telephone survey of a random sample of Buffalo-area residential customers of Niagara Mohawk Power Company. Niagara Mohawks' actual green power contribution program was described to these customers, and they were asked if they would like to enroll in the program at a cost of $6 per month. Of those that completed the telephone survey, 20% agreed to sign up. If those who did not complete the survey are assumed to be negative responses, the participation rate would fall to 16% (Poe et al. 1997, Rose et al. 1997).

Public Service Company of Colorado
A market simulation study asked Public Service Company of Colorado customers who indicated a willingness to contribute to a voluntary renewable fund if they would like to receive a program registration card. 75% requested a program registration card, but only 10% actually returned the signed form indicating a true willingness to pay the cost of the program (Byrnes et al. 1995).

Wisconsin Public Service
Nearly 9% of Wisconsin Public Service Company customers who were contacted by both telephone and then by mail actually registered to participate in the utility's green power program, while 4.7% of those that were contacted only by mail registered for the program (Byrnes et al. 1999).

Madison Gas & Electric
A large sample of Madison Gas & Electric customers was the subject of a mailed field test involving the sale of wind power. Perhaps the most sophisticated of the field tests to date, and also the one that best approximates the types of products most typically offered by green power purveyors, this study contains telling results. Of those responding to the survey (the response rate averaged approximately 55%), 47% agreed to pay a $2 monthly cost, 35% a $4 monthly cost, 23% an $8 monthly cost, and 8% a $24 monthly cost (note that the survey involved four different samples – one for each premium amount – and therefore the percentages do not add to 100%). These responses to an actual offer compare to responses to a hypothetical offer of 61% for a $2 monthly cost, 58% for a $4 monthly cost, 50% for an $8 monthly cost, and 31% for a $24 monthly cost (Champ and Bishop 1998).

and market simulations show that customer participation rates as high as 20% may be possible. And yet, even at this level, a substantial gap clearly remains between what individuals say they are willing to pay for renewable energy and what their behavior actually shows.

1.3.7 Why Pick Green Power as the Case

Though the contributions of individuals and communities to the maintenance of common pool resources has received considerable academic attention, far less academic focus has been placed on the possible contributions of green product demand to the provision of public, environmental goods. Green power offers an interesting case of the broader green products market for a variety of reasons:

- First, unlike some green products or behaviors where it is difficult to separate private and public interests (e.g., use of mass transit or the purchase of organic foods), renewable energy offers sizable public environmental benefits by offsetting conventional power production; at the same time, the purchase of renewable electricity offers few private rewards directly to the purchaser (e.g., direct health benefits, time savings, etc.). Though an inability to offer private rewards may complicate green power sales, it does allow a cleaner evaluation of the specific role of voluntary programs in delivering public, environmental benefits than cases that involve blended private and public motivations.

- Second, because the green power market is relatively young, I have been able to research it first hand since its inception in 1993, giving me a perspective on this market that would not be possible for more mature green product industries. Of course, this benefit seconds as a disadvantage: too little experience exists with green power demand to make broad and robust conclusions on the long-term fate of the market. This is one reason that I emphasize a number of conceptually distinct and manageable research topics as opposed to directly answering the broader and largely unanswerable question of the precise role that green power marketing (and green product marketing more broadly) can play in the provision of environmental goods.

- Third, the green power market is relatively discrete, defined, and bounded, allowing an ease of analysis that would not be possible for broader markets, such as the market for green products generally. In addition, it should also be noted that, while the environmental marketing literature has dealt with green product markets in broad terms, there have been few detailed academic studies of individual markets.

- Fourth, though advocates of renewable energy are not particularly interested in abstract academic theories of public goods, the energy policy community is struggling with how to support renewable energy in the future and the role that the green power market should play in providing that support. This gives the green power case a degree of policy relevance not likely to be achieved by many other possible cases. Related, because the literature on green power markets is a limited one that is dominated by gray literature, selection of this case potentially allows me to make a significant incremental contribution to the development and understanding of this market.

1.4 Research Approach and Methods

1.4.1 Basic Approach

As noted earlier, using green power as a case study, the principal goal of this dissertation is to gain further understanding of whether, to what extent, and under what conditions voluntary, customer-driven markets for green products can contribute to the provision of public environmental goods, and to better understand the reasons for the disconnect between the stated environmental preferences of consumers and their environmental behaviors. I do this through a number of conceptually distinct studies, represented by chapters in this dissertation, each of which tackles one of the research questions identified in Section 1.1. As will be clear from the discussion below, much of this work uses survey research and seeks to better integrate the economics and environmental marketing literatures.

1.4.2 Research Overview by Chapter

Chapter 2: Analyzing Early Experience with Green Power Markets in the United States

I begin in Chapter 2 by critically reviewing and analyzing early experience with green power marketing in the United States. My analysis covers both regulated green pricing programs and competitive offers in restructured markets. Aggregated data on program development, product offerings, customer response, and the impact of green power sales on renewable energy supply are presented. My purpose in this chapter is to both provide further background information on the green power case, and to explore what early experience with green power marketing can tell us about the prospects for this market to deliver public, environmental benefits. I find that, while a niche market for green power certainly exists, customer participation has been relatively modest to date, and I demonstrate that a significant gap exists between the stated willingness to pay for renewable energy by residential households and actual contributions to specific green power programs.

Chapter 3: Free-Riding: Understanding and Narrowing the "Gap"

Motivated in part by this gap between stated willingness to pay for renewable energy and actual participation in green power programs, Chapter 3 raises the possibility that the traditional economic concept of "free riding" may help explain the gap. In addition to introducing the social sciences literature on public goods and collective action, this chapter uses this literature to identify ways that green power purveyors might improve customer response to their green power offerings and help close the "gap" in light of customers' incentives to free ride. Specifically, what marketing and communications approaches might be used to increase voluntary demand for renewable electricity? To date, the environmental marketing literature has largely been practitioner oriented and, with some exceptions, has not attempted to develop broader theoretical constructs. This chapter represents one of the first attempts to apply a broader pre-existing theory, that of public goods and collective action, to the barriers faced by environmental marketers in selling their wares (for previous related efforts, see Rothchild 1979, Bloom and Novelli 1981, and Weiner and Doescher 1991). Because this chapter is largely a "think piece," whose conclusions are exploratory and remain largely untested, it may offer fertile ground for further research in the future.

Chapter 4: Understanding Non-Residential Motivations to Purchase Green Power

The use of voluntary programs to encourage pollution reduction among industry has become increasingly popular in the U.S. and Europe. Related, though most attention has been placed on residential demand for green power (and green products more generally), approximately 25% of all green power sales to date have come from business, governmental, and non-profit organizations. Why would such "early adopter" organizations – presumably driven by economic considerations – voluntarily choose to pay a premium for green power and thereby provide environmental improvements that benefit everyone? This chapter, relying on the first large-sample survey of non-residential green power purchasers in the U.S., explores the motivations of these organizations in purchasing green power. I find that *current* non-residential green power customers are, surprisingly, driven largely by altruistic concerns rather than by a desire to enhance the position or profit of their organization; a desire to improve employee morale is also shown to have significant importance. A majority of survey respondents prefer collective, policy-based approaches to supporting renewable energy as opposed to voluntary programs. These findings are shown to differ from much of the existing literature on firm motivations to voluntarily exceed environmental requirements, which typically focus on more self-serving business motives. The discrepancy may be explained in part by the smaller firms that dominate my sample and by the fact that this survey targets just the "early adopters" of green power; later adopters may be motivated by very different factors. In addition to contributing to the literature on firm motivations to exceed environmental regulations, the findings of this chapter provide insight on the future prospects for non-residential green power demand.

Chapter 5: The Role of Public Policy in Stimulating Green Power Demand

Though green power marketing and renewable energy policies are often viewed as conceptually distinct options for supporting renewable generation, Chapter 5 helps show how public policy and green markets interact. Motivated more by policy interests than theoretical ones, this chapter challenges the premise – sometimes proffered in debates over green markets – that profitable, sizable, credible markets for green products will evolve naturally without supportive public policies. Noting the limits to the current literature on the economics of market intervention and the more topical literature on the creation of competitive electricity markets, this study uses mail surveys of green power marketers to identify marketer preferences for specific regulatory rules and public policies. In so doing, the study sheds light on ways in which public policy might be used to increase voluntary contributions towards environmental improvements. It demonstrates that strong public policy actions will likely be needed to enhance participation levels and help close the gap between customer attitudes and behaviors. Recognizing that marketers are just one of many relevant stakeholder groups, the chapter highlights policy tensions that are at the heart of current debates related to green markets. Whether the policy actions desired by marketers are likely, especially in light of the California electricity crisis and the underperformance of restructured electricity markets to date, is addressed in the conclusions to this dissertation.

Chapter 6: Using Contingent Valuation to Explore Payment Preferences

Chapter 6 represents perhaps the most substantial work contained in this dissertation. Relying on both contingent valuation and opinion surveys of U.S. residents, the chapter explores the preferences held by individuals on different ways of supporting and paying for renewable energy. In particular, it evaluates preferences for collective renewable energy policies versus voluntary green power programs, as well as preferences for the degree of government involvement in these programs. This work helps one understand the reasons for the gap between stated intentions to purchase green power and actual purchases. The research also explores the scope of “free riding” and “strategic behavior” in contingent valuation studies by evaluating stated willingness to pay under both collective and voluntary payment methods; in addition to adding to the literatures on environmental marketing and public goods, this chapter thereby also contributes to the contingent valuation method. I also test whether individuals who state a higher willingness to pay for renewable energy are more likely to think that others will also contribute, and explore the possible implications of my findings for what is sometimes called the “bandwagon” or “reciprocity” effect? Finally, by examining what types of individuals state a willingness to pay for renewable energy under different payment contexts, this chapter builds on an extensive literature in marketing, psychology, and economics that profiles the environmentally motivated customer based on numerous demographic, socioeconomic, cultural, personality, and attitudinal variables.

Chapter 7: Conclusions

Chapter 7 concludes the dissertation. I summarize and integrate the findings from each of the other chapters, and highlight the implications of these findings for the green power market and for broader academic literatures. I also offer some parting thoughts on the longer-term prospects for green power market demand.

1.4.3 Summary of Research Methods

This research took place over a period of five years, from 1997 through 2001, and included both qualitative and quantitative phases. Data were collected from both primary and secondary sources. Primary data sources included semi-structured interviews and mail surveys. Secondary sources included written materials from both published and non-published documents. Though the specific methods used in the different phases of my research are detailed in each chapter, here I briefly summarize these methods.

Information contained in Chapter 2 was derived largely from secondary data sources, though some interviews with green power participants, market analysts, and renewable advocacy organizations were required to round out the data collection exercise. Secondary data sources are dominated by gray literature, with little refereed work related to green power demand as of yet. As with all chapters, my own personal observations of market development also influenced the writing of this chapter.

Chapter 3 is largely a think piece that seeks to apply public goods and collective action theory to the practical marketing tactics of green power sellers. As such, it is largely based on an extensive review of the public goods and collective action literatures that was undertaken in 1997.

Chapter 4 uses a mail survey of non-residential green power customers as the primary data source. Two surveys that varied only slightly were constructed: one for customers of regulated utility green pricing programs and another for customers of green power marketers in restructured states. The sample population of customers was compiled with the cooperation of five regulated utilities and two competitive marketers offering green power products. A copy of the survey for competitive marketer customers is provided in Appendix A. Survey questions were constructed to explore the motivations, green power purchase experiences and barriers, and policy preferences of business, non-profit, and governmental green power customers. The survey itself was administered in Spring 2000, with 1,800 surveys distributed to green power customers in the states of California, Pennsylvania, Oregon, Wisconsin, and Colorado. Non-respondents to the initial mailing were sent a second survey. After deleting undeliverable surveys, 464 completed surveys were returned, for a response rate of 27%. The data collected were rigorously analyzed using factor analysis, regression analysis, and other standard statistical procedures.

Chapter 5 relies on a small-sample survey of U.S. green power marketers initially mailed in December 1997, as well as subsequent semi-structured interviews with those same marketers, and a detailed review of regulatory filings and other relevant literature. The mail survey is included in Appendix B. The survey instrument was designed to elicit information on the relative importance of difference types of market barriers, market rules, and market facilitation efforts for the green power market; open and closed-ended questions were included. Because there were few green power marketers in existence at the time, a census of all 15 known green power marketers operating in competitive markets was sent the survey. After repeated reminders, 12 surveys were returned, for a response rate of 80%.

Chapter 6 represents the most complex, time consuming, and costly phase of the research conducted for this dissertation. It contains data obtained from 12 contingent valuation (CV) surveys and 1 opinion survey,[10] each mailed to a national probability sample of U.S. residents. Survey design began in early- to mid-2000. A focus group was conducted in October 2000 to test the survey instruments, and the instruments were further refined through successive comments received from professional and academic colleagues. PA Consulting, a survey research firm, administered a pre-test of the surveys in November and December of 2000; 202 surveys were distributed and a 55% response rate was achieved. Full implementation of the survey followed, with 4,056 CV and 544 opinion surveys distributed by mail. After four contacts by mail and a fifth attempted by telephone with each member of the sample, a total of 1,574 CV and 202 opinion surveys were returned for a response rate of 46%, after accounting for undeliverable surveys. Data were analyzed using bivariate and multivariate analysis procedures. Examples of the surveys and mailings are provided in Appendices C, D, E and F.

1.4.4 A Note on Timing

While conducting research for this dissertation, I have been encouraged to publish relevant findings. Consequently, a number of what are now chapters were published in refereed journals in the course of my research. Chapter 2 appeared in the journal *Energy and Environment* in late 2000. *Utilities Policy* published an earlier version of Chapter 3 in July 1998. Chapter 4 was published in *Energy Policy* in November 2001. Finally, Chapter 5 was published in *Renewable and Sustainable Energy Reviews* in late 2000.

[10] Each of these surveys also had randomized response orders for certain questions, resulting in a total of 26 different survey versions.

For the most part, the chapters in this dissertation maintain their published text and arguments. The principal exception to this rule is that each journal article generally contained data on actual experience with green power marketing. Because the research contained in the articles span a lengthy time frame, I have attempted to update certain data in each chapter to ensure their uniformity (and to eliminate some data where repetition would otherwise be a problem). I have also amended the abstracts and text of some of the chapters in non-substantive ways to improve the continuity of the dissertation text. None of these changes alter the basic content or arguments of each of these articles.

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Chapter 2

Customer Choice and Green Power in the United States: How Far Can it Take Us?[11]

ABSTRACT

This chapter explores whether and to what extent individuals are willing to voluntarily pay a premium for green power by critically examining experience to date with green power markets in the United States. This study provides an historical overview of the green power market, reviews product offerings, assesses customer response, and calculates overall support for renewable energy. While market research shows that a majority of the populace states a willingness to pay for renewable energy, early experience with green power marketing demonstrates that those attitudes have not yet translated into large-scale behavior change, tracking experience in other environmental product markets. Though a niche market for green power does exist, the data presented in this chapter indicate that the collective impact of customer-driven demand for renewable generation has been modest thus far. Much will need to be done if this market is to play a strong role in supporting renewable energy in the early part of the millennium. Several lessons on how to potentially improve the prospects of green power marketing are therefore discussed. An additional underlying purpose of this chapter is to

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[11] In the course of this dissertation research, a version of this chapter was published in *Energy and Environment*. It is reproduced (with some changes) here with permission from Wiser, R., M. Bolinger and E. Holt. 2000. "Customer Choice and Green Power in the United States: How Far Can it Take Us?" *Energy and Environment* 11(4): 461-477.

provide further details on the green power case, and therefore offer useful context for latter chapters of the dissertation.

2.1 Introduction

Concern for the environment among the American populace is well documented. Moreover, since the late 1980s, individuals have been increasingly given the opportunity to incorporate environmental concerns into their own purchasing behavior, from recycled paper and biodegradable packaging to organic foods and sustainably harvested timber. With numerous businesses now clamoring for a piece of the environmental marketplace, there is no doubt that consumers are increasingly inundated by environmental messages. Echoing these marketing practices, within a certain thread of the marketing literature there appears to be a growing consensus that the green market is significant and that companies can profit by improving environmental performance and developing green products (Ottman 1998).

And yet, a troubling disconnect between individuals' environmental attitudes and behaviors has emerged. While over 50% of adults in the United States are concerned about the level of pesticide residue on food products, for example, only 18% say they look for food that is pesticide-free and just 2% of overall produce sales in the U.S. are organic (Hartman Group 1996). Likewise, despite high levels of stated interest, the majority of consumers purchase green products only when they are offered at a competitive price and with no degradation of quality or convenience. Getting commuters out of their single passenger cars and into mass transit or carpooling has been similarly intractable. Few activities beyond recycling have shown a close connection between general environmental attitudes and individual behaviors.

With the advent of customer choice in the electricity sector worldwide, yet another opportunity arises to explore whether and to what extent individuals are willing to voluntarily pay more for products that provide public environmental benefits. While the electricity sector contributes heavily to the nation's environmental woes, surveys consistently show strong support for renewable energy among the American populace and a stated willingness to pay a premium for those resources (Farhar 1993). With customer choice, individual electricity customers across the United States and in other wealthy countries are being given the opportunity to act on these stated preferences. As of mid-2001, approximately 80 utility programs in the U.S. offered electric ratepayers a "green power" option in a regulated context, linking customer payments to the supply of renewable electricity. At the same time, as retail electricity markets have opened for competition in the U.S. states of California, Pennsylvania, Massachusetts, Rhode Island, Texas, Connecticut, and New Jersey, competitive green power marketers have sought to attract customers away from their traditional utility service with renewable energy products.

As with environmental marketing more broadly, there has been considerable debate over the likely success of green power marketing in stimulating renewable energy development and thereby achieving environmental gains. Green power marketing has been heralded by some as potentially offering significant new market opportunities for renewable electricity generation (Nakarado 1996). Others argue that green power marketing is unlikely to have a consequential impact on renewable energy development.

The cost of marketing green products, the intangible nature of green power, and the traditional logic of economics that individual consumers act to maximize their own well being (not the well being of society) when making such product choices, are frequently noted as fundamental barriers to the development of this market (Rader & Short 1998; Wiser 1998).

Regardless of whether it lives up to its potential, using customer choice to support renewable energy appears here to stay. Though events in California have shown the frailty of restructured electricity markets, a number of states already allow retail choice and others are moving (now more slowly) towards that objective. Similar market liberalization is occurring in Europe and the rest of the world. Meanwhile, where restructuring is not occurring, electric utilities are increasingly offering green power products to their ratepayers as a tariff option. Understanding the likelihood of tapping into such a consumer market to affect environmental change and improve the prospects for renewable energy is clearly of some importance.

The aim of this chapter is to contribute to current debates on the effectiveness of green power marketing in meeting renewable energy and environmental objectives. To meet this aim, I critically review and analyze the status and impacts of U.S. green power marketing to date. My analysis covers both regulated green pricing programs and competitive offers in restructured markets. Aggregated data on program development, product offerings, customer response, and the impact of green power sales on renewable energy supply are presented. I also assess some of the crucial variables that affect demand for green power and the quality of green power products. I conclude with a discussion of the role that green marketing has played and might play in the development of renewable energy sources and the achievement of environmental objectives. Data used in this paper come from surveys and interviews with green power participants, secondary literature sources, and the author's professional experience in these markets. Much of this data has been presented in a more detailed fashion in a series of EPRI and LBNL reports (e.g., Holt 2000a; Holt 2000b; Wiser et al. 1999).

2.2 Utility Green Pricing Programs[12]

2.2.1 History and Overview

Green pricing programs offer electricity ratepayers the ability to support renewable energy through voluntary payments to their regulated utility. First introduced in the U.S. in 1993, utility green pricing programs initially grew out of market research showing that a majority of individuals support renewable energy, and in many cases state a willingness to pay more for it. Green pricing programs were originally viewed by utilities as a way to tap into customer support for renewables and experiment with the use of renewable electric generation with little risk to utility shareholders. As states began to move towards retail competition in the electricity sector, green pricing programs were increasingly viewed by regulated utilities as one way to prepare for the rigors of an impending competitive market.

Interest among utilities in green pricing programs has grown steadily since 1993, as illustrated by Figure 2-1, which provides data through mid-2001. What began as three vanguard programs in 1993 had grown to nearly 80 programs by mid-2001, available to

[12] Unless otherwise specified, the majority of the data in this section come from Swezey and Bird (2001), and www.eren.doe.gov/greenpower.

the customers of about 220 utilities.[13] Green pricing programs are offered in 29 states, and in nearly every region of the U.S. with the exception of the Northeast (where the advent of retail competition has reduced utility interest in regulated green pricing programs). Collectively, these programs offer green power choices to approximately 20% of the residential households in the United States.

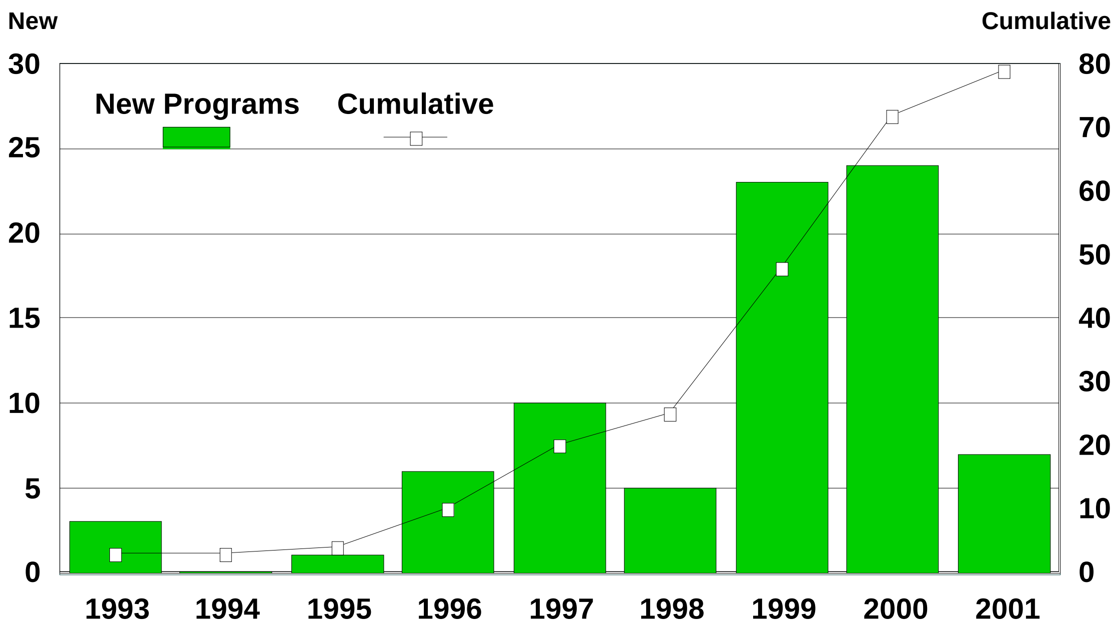

Figure 2-1. Number of Green Pricing Programs Launched Annually and Cumulative Number of Programs

2.2.2 Product Offerings

The variety of possible approaches to structuring green pricing programs has led to a range of product offerings by regulated electric utilities. Three general program types can be identified:

[13] Some programs are offered to the electricity consumers of multiple utilities, such as programs that are marketed jointly by several utilities or those that are offered through distribution cooperatives.

- energy tariffs (76% of total programs),
- contribution programs (20% of total programs), and
- capacity tariffs (4% of programs).

Energy tariff programs are the most common, charging a cents-per-kilowatt-hour premium based on a specific amount of renewable energy delivered to the grid. Utilities may sell energy-tariff products in energy blocks (e.g., 100 kWh of wind power) or as a percent of customer use (e.g., 50% renewable energy). The Public Service Company of Colorado (PSCo), for example, has popularized the sale of renewable energy "blocks," which represent 100 kWh/month of 100% new wind energy for a premium of $2.50 per block. **Capacity tariffs**, on the other hand, support the development of a specific amount of installed renewable capacity, charging customers a premium based on the number of capacity blocks they wish to reserve.[14] **Contribution programs** rely on voluntary donations that are not specifically tied to either delivered energy or installed capacity. A number of utilities, for instance, allow their ratepayers to contribute to the development of solar installations and educational material on or near schools. Also offered by some utilities but not emphasized here, **finance** programs use monthly customer payments to lease or finance, and install, customer-sited photovoltaic (PV) systems.

Of the 77 programs in place in mid-2001 on which data is available, 32 support wind energy, 11 PV, 5 landfill gas, 2 hydroelectricity, 1 geothermal, 26 a blend of resources, and 1 is undeclared. Solar PV is the only resource to be sold under all three

[14] Capacity tariff programs are similar to contribution programs in that they do not promise delivery of electricity per se. Unlike contribution programs, however, customers that contribute to a capacity tariff know in advance the type and capacity of energy resource that their payment is helping to support.

generic types of programs, and accounts for most of the contribution and capacity tariff programs. Wind power is sold through more than 50% of the energy tariff programs. Due to the nature of most green pricing programs, in which resources are developed based on customer response, almost all of the capacity brought on line under these programs is incremental or “new” renewable energy, which is generally considered environmentally superior to products that re-package pre-existing renewable capacity.

Product prices vary significantly across programs. Energy tariff programs have an average premium of approximately 2.5¢/kWh, with a range from as low as 0.17¢/kWh to as high as 17.6¢/kWh. The capacity tariff programs (which support PV installations), on the other hand, are often priced at approximately $6/month for a 100 watt block. (Assuming a 15% capacity factor for PV, this results in a price of 55¢/kWh). For those programs for which data are available (these data were collected late 1999), Table 2-1 presents the average monthly payments of green power customers, which are affected by both the product premium and the amount of renewable energy a customer opts to purchase.

Table 2-1. Average Monthly Payments for Utility Green Pricing Programs

Program Type	Avg. Monthly Payment	Sample Size
Energy Tariff	$6.04	21
Capacity Tariff	$7.78	2
Contribution	$2.19	6

Source: Holt, 2000a.

As is evident from these data, ¢/kWh premiums for energy tariff programs are considerably lower than for capacity tariffs, though the range in prices is substantial. Average monthly customer payments for both types of programs are similar, however, exceeding the voluntary contribution programs. Finally, I should note that these premiums do not always cover the complete cost of the program; marketing and overhead costs are often cross-subsidized by non-participating ratepayers or utility shareholders, allowing much of the premium to go towards renewable generation and not administrative costs.

2.2.3 Customer Response

While the majority of the green pricing programs are open to both the residential and non-residential sectors alike, residential customers have historically been viewed as the primary market. By mid-2001, utility green pricing programs in the U.S. were collectively serving approximately 190,000 residential customers. While not as common a practice, those programs that have actively marketed to non-residential customers have seen some success in attracting participation by a wider variety of customer types. By way of example, small commercial participants account for 38% of the wind power sold by Traverse City. Overall, 2,400 non-residential customers were being served by green pricing programs by mid-2001, representing 25% of total green power sales.

In judging the overall success of green pricing programs, these gross numbers of customers can be misleading as they give no indication of the number of customers that could participate if they so wished. Consequently, residential response is often gauged by percent market penetration, or the number of participants divided by the number of customers eligible to participate.[15]

[15] Some programs either limit participation or target their marketing specifically to a subset of the total customer base. Where effective eligibility numbers are specified, they are used as the base in calculating

Collectively, with 190,000 residential customers participating and a total of 20 million eligible to participate, residential market penetration equals just 1% nationwide. Residential penetration, however, varies considerably by program and program type, as shown in Figure 2-2.[16] The average market penetration is highest for energy tariff programs and lowest for capacity tariffs. The range of residential market penetration by program also varies considerably. Within the first few years of program initiation, a utility can expect residential market penetration from as low as 0.1% to perhaps as high as over 7%; with modest marketing and a reasonable product design, energy tariff programs can easily exceed 1% penetration.

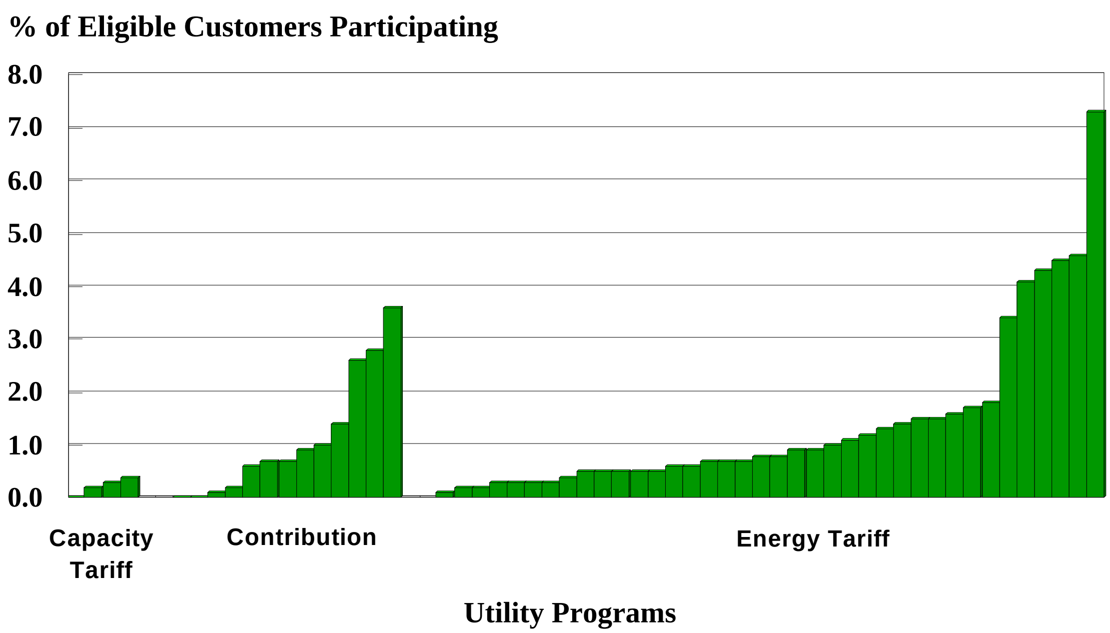

Figure 2-2. Customer Participation Rate by Utility Program

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market penetration; if not available, the entire customer base is used, thereby artificially reducing penetration numbers.

[16] Data presented on market penetration are from Holt (2000a) and are therefore somewhat dated.

What factors, other than program type, impact overall participation rates? Unfortunately, the data show an ambiguous or unexpected relationship among several variables. For instance, though one would expect to see participation decline as premiums increase, the data do not show this trend. Similarly, one would expect that programs that have been in existence for a longer period would see higher customer participation than newer programs. Yet, while participation certainly increases over time, several of the programs with the highest level of participation achieved that participation in less than a year. The data suggest, not surprisingly, that perhaps the quality of the product and how well it is marketed, the credibility of the utility offering the program, or the ease of participation are more important determinants of participation than are other variables. One variable that does seem to impact customer participation rates is the size of the utility and/or whether the utility is publicly owned. For example, publicly owned utilities account for 9 of the top 10 utilities in terms of customer participation rates, and most of these utilities are relatively small, suggesting that smaller publicly owned utilities may have a marketing advantage over their larger utility counterparts.[17]

2.2.4 The Supply Side: Support for Renewable Energy

Compared to the amount of non-hydro renewable energy capacity currently installed in the U.S. (~16,000 MW), the amount of renewable energy supported by green pricing programs to date is insignificant. In total, through mid-2001, green power demand across utility green pricing programs offered support for a total of about 110 MW of

[17] Possible reasons for this difference include higher credibility of the utility, ease of marketing to smaller communities, a high degree of local pride, and a friendlier community attitude towards green power.

incremental "new" renewables capacity that was brought on line to meet customer demands. Another 172 MW of renewable capacity was planned for installation within the next year to match expected increases in customer demand. Of the 110 MW, roughly 78 MW is wind energy, 4 MW is solar PV, 21 MW is biomass or landfill gas, and 7 MW is hydro. Using standard capacity factors for these technologies, this represents a total of approximately 50 average MW of renewable capacity.[18] At an assumed average premium of 2.5¢/kWh, this amount of capacity yields a total annual premium of about $11 million going to renewable generation serving green pricing programs.

2.3 Green Power Marketing in Competitive Markets

2.3.1 History and Overview

Retail choice emerged as an important driver of the U.S. electricity industry in the late 1990s. As of mid-2001, nearly half of all states had either opened their markets to retail competition—thereby allowing customers to select a new retail electricity provider—or had developed plans to move toward competition in the future.[19] California, Massachusetts and Rhode Island opened their markets to retail competition in 1998, and Pennsylvania has been open since 1999. Maine and New Jersey have each been open for a shorter period, both opening fully in 2000, with Ohio, Texas, Connecticut and others following in 2001. Though green power marketing began with monopoly utility green pricing programs, retail choice brings with it the possibility of an expanded and

[18] An average MW is a measure of capacity assuming that renewable generating facilities operate full time (i.e. have a 100% capacity factor), and therefore yields a conservative estimate of the true capacity supported by the green market.
[19] The U.S. Congress has also discussed national restructuring legislation.

more creative set of green products as competitive retail electricity providers vie for customers. Without continued regulation of product offers, however, customer confusion and deception are also a distinct possibility. Moreover, with the California electricity crisis of 2000-2001, the frailty of restructured electricity markets promises to slow the continued development of retail electricity markets nationwide. Several states have already postponed the introduction of retail competition.

Results to date from those markets that have been open have been mixed: while the overall level of residential customer switching to new electricity providers has been sluggish, a sizable portion of those customers who have switched electricity providers have chosen to purchase green power. Some have criticized the environmental value of the green power products being offered to consumers. The size and strength of the competitive green power market has also been shown to vary significantly depending on the particular set of regulatory rules and public policies established in a state. While the green markets in Massachusetts and Rhode Island have been nearly non-existent, for example, Pennsylvania and California's markets have attracted modest interest, at least until the California electricity crisis and the run-up in wholesale electricity prices in late 2000 and 2001. Green power marketing in New Jersey, Maine, Connecticut, Texas, and Ohio has begun more recently, with little switching overall and little data to report thus far.

In general, the slow rate of overall customer switching to new electricity suppliers (not to mention switching to green power providers specifically) can be attributed to several factors. First, the cost of attracting and signing-up smaller customers has been found by marketers to be prohibitive in many instances, thereby reducing marketing activity and/or squeezing or eliminating profit margins. Second, regulatory rules have been established in a way that limits the cost savings available to customers that switch providers. In particular, California, Rhode Island, and Massachusetts established low “default generation service prices” (the price a customer pays for electricity service if they do not switch providers), leaving competitive marketers little opportunity to offer price savings. Finally, even where savings have been available, the savings are often not sizable enough to convince large numbers of customers to spend the time necessary to compare electricity offers and select a new service provider.

Where a meaningful green power market has emerged, it appears to have been based largely on government incentives or a high default service price. Though the market collapsed in 2001, previously California’s green power market had been supported by a sizable subsidy (1-1.50¢/kWh) offered by the state for the sale of renewable energy products, called the “customer credit.” Because of this credit, several marketers were able to offer green power products at a slight *discount* to the price a customer paid if they stayed with their utility provider, making renewable energy directly competitive with conventional power. Pennsylvania’s green market, on the other hand, has offered few incentives to specifically favor renewable energy purchases. Default rates, however, have been relatively high in some Pennsylvania utility service territories, allowing green power products to gain a foothold in areas where, despite carrying a premium over other competitive offerings, they are still competitively priced relative to what a customer pays by remaining with the existing utility provider. (As with California, though to a lesser degree, this condition changed in 2001 as high wholesale market prices were felt nationwide).

Overall, as of mid-2001, eight retail marketers offered green power products to residential and/or small commercial customers in the competitive markets of California, Connecticut, Pennsylvania, Massachusetts, Rhode Island, New Jersey, and Texas. This is down considerably from one year earlier, prior to the Western electricity crisis. Pennsylvania's market contained five green power marketers in mid-2001, followed by three in Connecticut, two in Texas, and one in California (down from nine in mid-2000), Massachusetts, Rhode Island, and New Jersey. Nationwide, just one marketer has captured the lion's share of the residential green power market, Green Mountain Energy.

2.3.2 Product Offerings

As of mid-2001, seventeen green power products were marketed by the eight retail marketers targeting residential and small commercial customers. Seven were sold in Pennsylvania, three in Connecticut, two in New Jersey and Texas, and one in California, Massachusetts, and Rhode Island. A significant majority of these products contained substantial portions of "eligible" renewable energy as defined by Green-e certification criteria[20]: wind, biomass, geothermal, small hydro (< 30 MW), and solar power. Specifically, eleven of the seventeen products contained 100% eligible renewable energy, and three contained 50% eligible renewable energy. Nine of these products were Green-e certified. Three products contained less than the Green-e minimum of 50% eligible renewables content. Geothermal, biomass, wind, and small hydro facilities served the bulk of the product offerings, with solar power marketed in some products.

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[20] Green-e is a voluntary renewable electricity certification program run by the Center for Resource Solutions, a San Francisco-based non-profit organization. Green-e currently certifies products in California, the mid-Atlantic, Texas, Ohio and New England, and is active in other newly-forming competitive markets.

Unlike utility green pricing programs, the renewable portion of the competitive green power products is predominantly served by existing renewable energy facilities, which has been a major source of criticism of the green market (Rader 1998). The majority of existing facilities may be in little or no need of additional support to continue viable operations. Accordingly, while relatively inexpensive to incorporate into a green product, the immediate, incremental environmental benefits of purchasing such output are low. In response to this criticism, several marketers are beginning to differentiate their products based on the amount of new renewables content; sixteen of the seventeen products offered to residential and/or small commercial customers as of mid-2001 included some amount of new renewable generation. Increasing amounts of new renewable generation will likely be seen as the market matures and as marketers strive to comply with Green-e certification criteria requiring a minimum of 5% new renewable content in the second year of retail competition and escalating over time.

The pricing of these products also varies widely. To a great extent, this variation is a result of a number of public policies and regulatory decisions. As noted earlier, California has provided extensive subsidies to renewable generators and green marketers selling renewable energy-based products, thereby historically allowing certain products to be sold at a discount to utility default service. Pennsylvania provides far fewer subsidies to renewable generators and green power marketers, but high default service prices in some service territories have (before 2001) allowed marketers to offer green power at a discount or small premium to utility service. Massachusetts, Rhode Island, New Jersey, and Connecticut all have low default service rates, and consequently the only green products offered are sold at a premium. The overall range of product premiums varies from a couple dollar discount to a premium of nearly $15 per month for an average household consuming 500 kWh/month.

2.3.3 Customer Response

As a subset of the overall residential direct access market, green power is doing relatively well. Overall residential customer switching, however, has been slow:

- In **California**, at the peak of the market (June 2000) only 165,000 residential customers (or 1.9% of all eligible residential customers in the state) had switched suppliers. Nearly all who had switched were being served by a green power product, however, a direct result of the incentives offered by the state. Because of these incentives, the majority of these customers had either selected a green power offering at a discount to the utility default rate or had been "upgraded" to green power by their energy service provider in order to capture the customer credit. More recently, customer switching has plummeted, with only 57,000 residential customers taking service from a competitive supplier as of January 2002. Moreover, in late 2001 incremental switching was disallowed by the California Legislature and Public Utilities Commission.
- **Pennsylvania's** overall electricity market has been more robust, with roughly 350,000 residential customers actively switching providers through July 2001, representing 12% of all eligible residential customers in the state (another 225,000 customers are being served under competitive default service). Approximately fifteen percent of these – about 80,000 or 1.6% of eligible customers – have

chosen a renewable energy product, though most have selected a “light” green product consisting of 1% landfill gas and 99% natural gas. Approximately 20,000 customers have selected a product with over 50% renewable energy content.

- **Massachusetts and Rhode Island** have seen only negligible customer switching overall (approximately 0.1% of residential customers have switched in both markets), with perhaps 1,000 green power purchasers combined.
- **New Jersey, Connecticut, and Texas** have only been open for retail competition for a short period. Overall residential customer switching in New Jersey and Connecticut has been low and, while green power is offered in both states, the number of green power customers is unknown, but expected to be small. Texas has more recently opened. While the market is expected to be a robust one, data do not yet exist on customer switching and green power demand.

In aggregate, 115,000 customers were purchasing green power in competitive markets as of mid 2001, representing approximately 0.5% of those customers eligible to switch suppliers. Most of these consumers were purchasing products that contained at least 50% eligible renewable resource content. Another 565,000 customers, or approximately 3% of eligible customers, were purchasing “clean” power products, which are typically comprised of a small percentage of renewable power (1-2%).

Finally, I should note that, while not the primary target of most green power marketers, approximately 40,000 commercial, industrial, and institutional facility meters were being served with a green power product in California at the peak of that market, representing approximately 50% of all green power demand in the state. As in the residential market, a significant portion of this non-residential switching activity was driven by the state's renewable energy incentive program. In Pennsylvania, non-residential customers are estimated to constitute 25% or more of total green power demand.

2.3.4 The Supply Side: Support for Renewable Energy

Because many green power products contain less than 100% "eligible" renewable energy, the number of customers switching to green power does not readily translate into substantial support for renewable energy. This is particularly true in Pennsylvania, where it is estimated that perhaps 60,000 of the 80,000 customers choosing green power have selected a product whose renewable energy content is 1% or less.

Based on data through mid-2001 and a few assumptions about which products were being selected, the competitive green power market was supporting a total of roughly 140 average MW of renewable energy.[21] A more important metric for the success of the green power market, however, is its ability to stimulate investment in new renewable energy facilities. As indicated in the preceding survey of products, however, most of the renewable energy support is going toward existing renewable resources. According to data from the National Renewable Energy Laboratory, 132 MW of new renewable capacity (45 average MW) were serving the green market (125 MW of wind,

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[21] This estimate is based on the following assumptions: 115,000 residential customers purchasing products with an average of 70% renewable energy content; 16,000 small commercial customers in California purchasing 100% renewable energy products; a 25% adder to residential customer demand to cover non-residential customer demand in other states; and 565,000 residential customers purchasing products with an average renewable energy content of 1.5%.

400 kW of solar, 5 MW of geothermal, and a couple MW of landfill gas) by mid-2001, with far more under development.

Another way to gauge the success of the green power market is to look at its financial support of renewable generation facilities. Data from the Automated Power Exchange (APX) in California shows that the wholesale premium for existing renewable generation has averaged about 0.3¢/kWh over the price of conventional power over the last few years. Assuming similar premiums in Pennsylvania and other states, and making several assumptions about the higher premiums commanded by new wind and solar facilities, the renewable capacity supported by the green power market received approximately $10 million per year in above-market payments in 2001.[22] It is not clear, however, how much of this revenue was returned to the generators and how much was kept by wholesale marketers.

Marketer profitability is perhaps another indicator of the sustainability of the green power market, as there would be no market without retailers willing to sell green power. Based on data from the APX, green power marketers in California historically paid an average wholesale premium of roughly 0.3¢/kWh and received the average customer credit of 1.25¢/kWh, locking in a gross profit margin of just under 1¢/kWh if they price their product at the default generation price. Assuming similar profit margins in Pennsylvania and other states, the green market generated perhaps $15 million per year nationwide in 2001 (this estimate ignores the 565,000 customers purchasing products

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[22] This estimate assumes: 0.3¢/kWh premium for 95aMW of renewables capacity; 125 MW of wind, 5 MW of geothermal, and 3 MW of landfill gas at a 1.5 cents/kWh premium, and 400 kW of solar capacity at a 25 cents/kWh premium.

with small percentages of renewable energy).[23] However, high start-up and customer acquisition costs, which in the early days of the California market ran upwards of several hundred dollars or more per customer, have thus far overwhelmed profit margins from power sales, prompting a number of marketers to abandon the residential market while others look for less-costly approaches to marketing their products and other ways to improve turnover.[24]

2.4 Improving the Prospects for Green Power: Lessons Learned

Experience to date with competitive green power markets and utility green pricing programs suggests that this is a market that will be built slowly, not one with immediately strong underlying demand. Residential participation rates in the early years after product launch have seldom exceeded 3%, with many programs not reaching 1% penetration. Demand most often must be created through effective customer education and intensive marketing of high-quality products – activities which, when undertaken solely by marketers or utilities, greatly increase customer acquisition costs, thereby reducing the profitability and the attractiveness of the market. At least some portion of these costs – particularly those associated with educating consumers about customer choice in general – can be defrayed by conducting effective customer education campaigns as part of restructuring plans. Pennsylvania's Public Utilities Commission did just that,

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[23] This estimate is based on the following assumptions: 115,000 residential customers; 16,000 small commercial customers in California; a 25% adder to residential customer demand to cover non-residential customer demand in other states; and a gross margin of 1 cent/kWh.

[24] Affinity marketers and the internet have proven to be popular low-cost marketing alternatives, while marketers have also begun to search for ways to "bundle" other products (e.g., telecommunications, energy efficiency, natural gas) with their traditional electricity services.

aggressively encouraging ratepayers to switch suppliers. Perhaps at least partly in response, 12% of all eligible residential customers in Pennsylvania had switched suppliers as of mid-2001, as opposed to about 2% in California at the peak of that market, where the funds spent by the state on customer education were targeted towards consumer protection rather than encouraging switching.

A more probable cause of the disparity in switching rates, however, appears to be differences in the regulatory “rules-of-the-game.” As discussed by Wiser (1999) and in Chapter 5 of this dissertation, green power marketers believe that the first priority for regulators and legislators interested in seeing the green market develop should be to design the basic regulatory rules in ways that allow overall retail competition to emerge, minimize barriers to entry, and encourage customer switching. The design of default service pricing is viewed as particularly crucial. Figure 2-3 shows the relationship between default service pricing and residential switching rates in California, Massachusetts, Rhode Island and the various Pennsylvania service territories, with data from mid-2000. Clearly, the level of residential switching is a function of the default rate for generation service. As mandatory rate cuts and stranded cost recovery affect the default rate, careful consideration should be given to the effects of these policy decisions and market rules on the development of a robust competitive market. Of course, it goes without mention that the recent Western electricity crisis is likely to have a considerably negative impact of retail electricity choice nationwide, which will in turn negatively impact demand for green power.

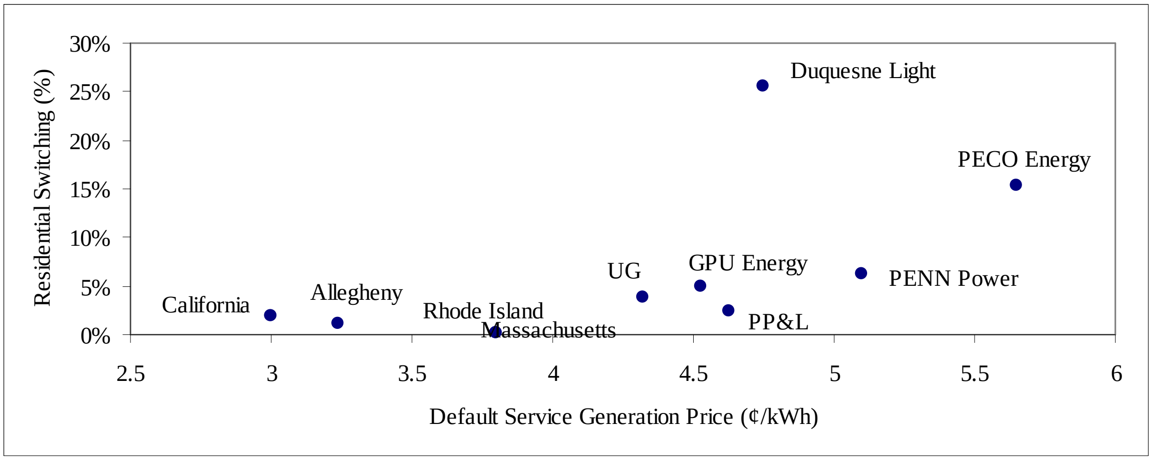

Figure 2-3. Effect of Default Generation Price on Residential Switching

As experience in California – where the customer credit was the primary driver behind the green market – illustrates, financial incentives to support green power products can play an important role in offsetting the market-stifling effect of a low default rate and stimulating the development of the green power market (Byrne 2000). If the incentive is large enough, as it was for a time in California, green power may even be priced competitively with conventional power products. If the default rate is low enough to inhibit customer switching in general, however, or if the financial incentive is temporary, then public policy support may do little but temporarily prop up a market with little underlying promise, as it did in California. It is not clear whether state policymakers, in considering such incentives, have given adequate thought to their importance, design, and impacts.

Although most marketing efforts to date have targeted the residential sector, green power purveyors would be well advised to look to the non-residential sector as well. Recent experience suggests that some small and large businesses, as well as municipal, state, and federal government facilities, are interested in purchasing green power.

Experience with several green pricing programs, as well as evidence from Pennsylvania and California, suggest that these customers could easily constitute 20% of total green power demand. Non-residential customers are attractive clients for several reasons. First, non-residential customers often purchase large amounts of green power, translating into more cost-effective marketing. Second, non-residential purchasers are often high-profile businesses or organizations that choose to publicize their switch to renewables through press conferences or press releases, providing positive media exposure and free advertising to the chosen marketer or green pricing program in particular, and to the green power market in general. Finally, marketers or utilities can sometimes secure a longer-term contract from non-residential customers than they can in the residential sector, thereby reducing market risk.

Finally, green power demand will only translate into environmental improvements if the products being marketed as "green" provide true environmental benefits. Moreover, unlike some personal environmental behaviors (e.g., recycling), green power is an entirely intangible product and does not allow for facile verification of environmental value by consumers. Unfortunately, competitive market pressures have resulted in some degree of "greenwashing" among green power providers, particularly during two retail competition pilot programs in New England where several products were marketed based on hollow green claims (Wiser et al. 1999). Product quality has increased over time, in part due to the emergence of environmental disclosure requirements and green power certification programs in markets open to retail competition. And yet, there remains a need for further product improvement. For example, the most popular green product in Pennsylvania contains only 1% renewable energy, and the amount of new renewables capacity serving competitive green products is lower than one might hope. Clearly, if green marketing is to make a meaningful contribution towards public renewable energy and environmental goals in the new millennium, purveyors and advocates of green power will need to continue to strive for environmental upgrades in product design.

2.5 Conclusions

While a niche market for green power clearly exists, the data presented in this paper indicate that the collective impact of customer-driven demand on the renewable generation market has been modest to date. As with other environmental products, a sizable disconnect exists between stated attitudes toward environmental products and actual demand for those products (Kempton 1993). While market research shows that a majority of the U.S. populace states a willingness to pay a premium for renewable energy, early experience with green power marketing demonstrates that those attitudes have not yet translated into large-scale behavior change. Only a small fraction of American consumers have thus far demonstrated a willingness to voluntarily make a personal financial sacrifice by selecting a higher-priced green power offering. As with other green product markets, price, performance, and convenience concerns appear to dominate consumer behavior (Ottman 1998).

As of mid-2001, roughly 40% of all U.S. households had access to a green power product, split almost equally between utility green pricing programs and competitive green power markets. Under 1%, or 305,000 of those eligible households, were being served by a green power product (if defined to include products with far lower amounts of renewable power, the participation rate increases to over 2%). A total of 200 average

MW of renewable capacity served the entire green power market, of which perhaps 100 average MW represented new capacity brought on line to meet customer demand.

Compared to the existing amount of non-hydro renewables capacity in the U.S. (16,000 MW) or to the projected impacts of more traditional state and federal renewable energy policies (see Wiser, Porter & Clemmer 2000), these raw data show a modest contribution by green power marketing to date. The analysis also strongly suggests that full reliance on the green power market to meet national renewable energy objectives would be premature at this time; traditional forms of public policy support will continue to be needed for the commercialization and maturation of the renewables industries.

It remains too early, however, to draw *definitive* conclusions about the contribution that the green power market might make towards renewable energy development objectives over the long run and further into the new millenium. After all, the green market—and the larger market for retail electricity service—is still in its infancy, with only a few years of experience in the most mature markets. Making long-term projections of the impact of green marketing based on this experience is challenging, at best. Market penetration could stagnate at 2-5% or less of residential demand, or it could grow steadily over time, consistent with the development of other product markets and environmental behaviors. Twenty years ago, for example, only 10% of the U.S. municipal solid waste stream was recovered for recycling, while today nearly 30% is recycled. Supportive public policies and curbside recycling programs have no doubt played a vital role in this growth, yet at the same time such success would not have been possible without the voluntary efforts of millions of people. The percentage of financial assets that adhere to socially responsible investment criteria has also grown steadily, recently reaching 13% of the total market. Similarly, since the opening of the long-distance telephone market in 1984, competitors have captured over half of AT&T's market share – not in great leaps and bounds, but rather through a gradual and steady increase averaging 5% per year.

The fundamental challenge to making a long-term projection of the viability of green power marketing is that we do not yet know why individuals do or do not make the financial sacrifice to purchase green power products. Economic theory generally suggests that the majority of individuals are fundamentally self interested, caring primarily for their own well-being and not altruistic enough to contribute significantly towards public goods as consumers. If this is the case, customer-driven green power markets that are based on higher-cost renewable energy products will only thrive if a fundamental shift in the moral and ethical character of our society comes about; in its stead, *collective* public policy efforts will necessarily continue to be the sole or dominant method of achieving environmental improvements. If, on the other hand, there is a latent, sizable group of individuals and organizations that can be motivated to make a personal financial commitment to purchase environmentally preferable products, then a more substantial green market may develop with time, educational and marketing resources, and certain enabling public policies. These issues are addressed in later chapters of this dissertation.

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Chapter 3

Green Power Marketing: Increasing Customer Demand for Renewable Energy[25]

ABSTRACT

As highlighted previously, because demand for green power is analogous to the voluntary provision of public goods, some believe that green marketing will not, on its own, provide a large market for renewable energy. After all, individuals have strong incentives to "free-ride" and therefore not contribute to the provision of public goods. Such behavior is an obvious possible explanation for the wide gap between stated and actual willingness to pay for environmental goods, including green power. This chapter reviews aspects of the extensive literature on public goods, free riders, and collective action, and explores some of the implications of this literature for the green marketing of renewable energy. Using this literature as a guide, I recommend four strategies that might be used by marketers to boost participation in green power programs and thereby help close the "gap" in light of customers' incentives to free ride.

3.1 Introduction

As customer choice is introduced in electricity markets, low-cost providers are expected to dominate the market. Yet customer choice may also create new markets for

[25] In the course of this dissertation research, a version of this chapter was published in *Utilities Policy*. It is reproduced (with some changes) here with permission from Wiser, R. 1998. "Green Power Marketing: Increasing Customer Demand for Renewable Energy." *Utilities Policy* 7 (2): 107-119.

higher-cost renewable energy resources. Retail competition will allow customers to select their power provider, and growing evidence suggests that some customers will make purchase decisions based, in part, on the environmental characteristics of the power supply. Green power marketing targets such customers under the assumption that they will pay a premium for environmentally preferable, or green, electricity products (Nakarado 1996).

An increasing number of consumer products are differentiated based on their environmental attributes, and within the marketing literature there is a growing consensus that the green market is significant and that companies can profit by improving environmental performance and developing green products (Ottman 1993). Nonetheless, not all green products are successful in garnering customer interest, and customer surveys of attitudes toward, and even intended purchase of, green products often substantially overestimate actual product demand (Kempton 1993). As with all products, green products must overcome traditional marketing challenges to increase demand and narrow this gap between stated intentions and purchase behavior. Yet it is also now recognized that there are many obstacles to selling a green product that do not arise in traditional product marketing (Wiener and Doescher 1991, Rothschild 1979, Bloom and Novelli 1981).

As discussed in detail later, one such obstacle is that the purchase of renewable energy, like other green consumer products, can result in net public environmental benefits. Customer demand for green power is therefore analogous to the voluntary provision of public goods and, as with all public goods, there is a risk that few customers will voluntarily pay a premium for green power products (Rader and Norgaard 1996).

After all, traditional economic theory suggests that, because the benefits of a public good cannot be captured solely by the purchasing customer, individuals have strong incentives *not* to contribute but to instead "free ride" and enjoy the benefits of the public good while avoiding payment. If this public goods dilemma holds, green marketing may not substantially increase renewables development and green power marketers may not be particularly successful. On the other hand, if people—for whatever reason—are willing to pay for public goods, then they may participate in green marketing at levels sufficient to create a large new market for renewable energy developers and marketers.

Given the growing number of green marketing programs for renewable energy, the potential for public goods free-riders, and the contention of some that green marketing may be able to supplant traditional renewables policies, important research questions emerge: (1) Will customer-driven markets for renewables really develop? (2) What factors influence individuals' incentives to free ride and under what conditions are individuals willing to contribute to public goods? (3) How can green marketers design their programs to help overcome the public goods dilemma and thereby boost customer demand for renewable energy? and (4) Does the establishment of green markets obviate the need for explicit public policy support for renewables?

The purpose of this chapter is to address some of these questions by applying the extensive economic, public policy, behavioral, and marketing literature on voluntary contributions to public goods, and to therefore begin to develop a deeper understanding of when, why, and how green product markets develop. Specifically, this chapter discusses the implications of this literature for green power marketers selling renewable energy products and provides insights into the necessary modifications of traditional marketing practices when public goods are involved. The first section reviews and summarizes relevant academic literature on public goods, free riding, and collective action problems. Next, the implications of this literature for green power product design and marketing communications strategies are highlighted. Four approaches that might be used by marketers to increase customer demand for renewables are emphasized. The final section of the chapter discusses some policy implications.[26]

3.2 Public Goods and Free Riders

It is clear that there are a number of obstacles that confront the green power marketer in narrowing the gap between the 40-70% of residential customers that indicate a willingness-to-pay a bit extra for renewable energy in surveys and the much lower actual demand for green power experienced in green pricing programs and states that have opened their markets to electricity restructuring. One critical barrier is that green power is not a typical product because its purchase can help supply public goods or, more precisely, reduce the supply of "public bads." Demand for green power is therefore analogous to the voluntary provision of public goods and there is a risk that few customers will pay a premium for green power.

This chapter argues that, in order to boost customer purchases of renewable energy, traditional marketing strategies must be adapted for effective use in a public

[26] There is a range of opinion on how to define a "green" power product and a number of legislative, regulatory, private, and nonprofit efforts are underway to do just that. For the sake of this chapter, however, green power is simply defined as electricity that is differentiated based on its environmental attributes, therefore ignoring the sticky question of whether specific types of power products and particular generators *really* supply net environmental benefits. As a practical matter, there appears to be a general consensus that many forms of renewable energy, including solar, wind, geothermal, and biomass, should be considered to be "green." As a result, most (though certainly not all) green power products have contained substantial quantities of these renewable energy resources.

goods context. The extensive academic literature in the social sciences on public goods, free riders, and collective action can provide a useful theoretical framework for these efforts, yet there have been few attempts to see if and how this literature applies to the case of green product markets. It is important to recognize of course that other theoretical frameworks can also be used to help understand these markets, and this chapter will not make the claim that the public goods dilemma is the only or even the primary marketing problem. The public goods literature can, however, be used to develop a deeper understanding of the strengths and weaknesses of green marketing, the conditions under which individuals will pay a premium for green products, and the approaches marketers can take to increase customer purchases of those same products. This literature is introduced in this section by describing the characteristics of public and private goods, the nature of the public goods that are provided via increased use of renewable energy, and the characteristics and extent of the free-rider problem. In the next section of the chapter, the specific implications of the public goods literature for green power product design and marketing communications strategies are highlighted.

3.2.1 Private Goods and Public Goods

Economic goods can be broadly separated into two categories: private goods and public goods. A *pure private good* is one in which the producer unilaterally bears all the costs of production and a single consumer enjoys all of the benefits of consumption. In contrast, a *pure public good* has the defining qualities of nonrivalry and nonexclusivity. Nonrivalry means that one person's consumption of the good does not limit the capacity of others to consume the same good, and nonexclusivity implies that it is not feasible to prevent consumption by those who fail to pay for the good.

3.2.2 Can the Use of Renewable Energy Provide Public Goods?

The commodity supply of electricity produced by a renewable energy project and transmitted to a customer is a private good. To the extent that the use of renewable electricity offsets conventional power supply, however, renewables are also claimed to provide net public benefits. Green power marketing can therefore be viewed as a vehicle for the provision of public goods through the bundling of renewable energy with a concomitant reduction in conventional electricity generation. Though they are not all unique to renewable energy per se, this bundled product has three characteristics that are often claimed to provide public benefits. These benefits exhibit the traits of nonrivalry and nonexclusivity and therefore cannot be captured fully by individual customers; instead, the benefits accrue to all customers, irrespective of individual participation in green power programs.[27]

First, and perhaps most importantly, while every energy source has negative impacts on the environment, renewables are generally believed to cause less environmental damage per unit of energy output than conventional forms of electricity generation such a fossil and nuclear (Hohmeyer 1988). Therefore, when renewable generation offsets conventional power supply, net environmental benefits will typically be provided. Second, the research and development and "intellectual property" that goes

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[27] The intent here is to describe the characteristics of renewable energy generation that are often claimed to provide such net public benefits, without commenting on the persuasiveness of the claims or the magnitude of the benefits.

into creating renewable energy systems and components is a public good because private actors often cannot easily appropriate the *full* social surplus from their innovations, even with patents and property rights (Teece 1986). In other words, by helping to commercialize new renewable energy technologies, green power customers are benefiting all of society in the form of possible long-term electricity generation cost reductions, and may be unable to capture the full social benefits of their efforts.[28] Finally, relative to other forms of electricity generation, the reductions in fuel price and supply interruption risks provided by renewables are claimed by some to have public characteristics. Though it might appear that these risk reductions are largely private goods because they can be captured by individual customers who purchase renewables, Rader and Norgaard (1996) argue that risk reduction is systemic and has public benefits because it reduces shocks to the economy as a whole.

3.2.3 The "Free Rider" Problem

Most broadly, for a public good to be provided at an economically efficient level, the sum of all individual marginal valuations of the good (e.g., the marginal social benefit) should equal its marginal cost. Public goods are susceptible to underprovision, however, because rational individuals have strong incentives *not* to contribute, but rather to free-ride on others' contributions. This situation arises because any individual's contribution to a public good has a negligible effect on its provision, and by free riding the rational individual is able to enjoy the benefits of the public good—given its nonrival

[28] This public good is not, of course, limited to renewable energy technologies. Because many of the traditional electric generation technologies are mature, however, they are unlikely to be plagued as seriously with this form of market failure.

and nonexcludible characteristics—while avoiding payment. Because of this incentive to free ride, the standard presumption of neoclassical economics is that private, decentralized markets cannot be relied upon to provide public goods at an economically efficient level (see, for example, Samuelson 1954, Olson 1965). This underprovision constitutes a form of market failure and is often a rationale for government intervention to encourage or mandate the supply of public goods.

The pervasiveness of the free-rider problem has been questioned, however, and the degree and conditions under which individuals actually do voluntarily contribute to public goods has become the subject of a great deal of theoretical, experimental, and field research in economics, political science, sociology, and psychology. First, recent game theoretic work demonstrates that there are, in fact, situations in which it is in the economic interest of individuals to contribute toward public goods (Ostrom 1998). Second, experimental investigations designed to assess the extent of individuals' willingness to contribute to public goods typically find that, even in relatively antiseptic laboratory environments, people contribute to a greater extent than that predicted by economic theory. The experimental literature does offer somewhat divergent results, however (Davis and Holt 1993). Though a number of studies reveal that 40-60% of individuals are willing to contribute even though, *individually*, they would be better off not contributing (Marwell and Ames 1981, Isaac *et al.* 1984), nearly full free riding has been generated in some contexts (e.g., Kim and Walker 1984, Isaac *et al*. 1985). Finally, simple observation demonstrates that some people do in fact contribute to public goods through charitable donations, participation in mutual aid organizations, and green product purchases. Moreover, a great deal of field research has documented the conditions under which communities are able to successfully manage common-pool resources (Ostrom 1990, 1998). Because it is hard to establish what would occur in the absence of free riders, it is difficult to evaluate the magnitude of free-riding in real world situations (Green and Shapiro 1994). Nonetheless, this real world experience provides *some* evidence of at least a limited willingness-to-pay for public goods.

Even where people do contribute toward public goods, however, it is not clear whether they do so with the public good in mind. Where contributions exist, defenders of traditional economic theory counter that the contributions may not capture *true* willingness-to-pay (WTP) for public goods, but rather only the “warm glow” that comes from the act of giving (Andreoni 1988) or the presence of coercion or sanction, private inducement, or social pressure (Chong 1996, Olson 1965). That is, by expanding the scope of “self-interest,” a wide range of nontraditional private goods are hypothesized to influence individual behavior. Where contributions toward public goods are motivated by these “private” interests, underprovision of the good may remain. Unfortunately, with the inclusion of these nontraditional private goods, the public goods theory becomes largely irrefutable and tautological. Given the lack of specificity about what it means to be a “rational actor,” and the possible inclusion of a wide variety of “selective incentives” (i.e., social pressure, psychic benefits, etc.), it is not obvious what sorts of behavior would fail to be explainable by some variant of the public goods theory (Green and Shapiro 1994). This leaves the theory itself almost entirely devoid of predictive power, though, as will be seen shortly, the theory can still provide important explanatory insights (Chong 1996).

Overall, the public goods theory as traditionally described by neoclassical economics appears to provide a useful, if idealized, model of human behavior. Because of the underlying assumptions on which the theory is based (individualism, maximization of self interest, and rationality), the theory underestimates the complexity of influence processes, behavioral change, and human decision-making. The "strong" version of the theory, in particular, posits a higher level of selfishness and a stricter definition of well being than that which appears to motivate human behavior. Perhaps the most important lessons that can be gleaned from the diverse and contradictory literature on public goods, free riders, and collective action problems are that: (1) people tend to contribute to public goods at levels that exceed that predicted by traditional economic theory; (2) there are a number of ways to increase contributions toward public goods; and (3) individuals do not act solely in their own, narrow material self-interest, and appear to obtain utility from a wide range of nontraditional private benefits (e.g., social acceptance, altruism, etc.). At the same time, it is clear that there continues to be a significant level of free riding in a wide variety of situations.

3.3 Increasing Program Participation: Recommendations for Marketers

The absolute magnitude of the free-rider effect has been questioned, but most academics would agree that free riding *can* present a significant problem in a wide variety of situations and that the private provision of public goods is frequently difficult. It would not be fair to label all of the individuals who do not purchase green products as public-goods free riders. After all, some may simply not care about renewable energy or the environment, others may not be aware of their green power options, and still others may be concerned about the veracity of the green claims made by marketers. Nonetheless, in order to increase demand for green power by those individuals who do understand their green power options and are convinced that the purchase of these products can provide public benefits, marketers will have to overcome consumers' strong economic incentive to free ride.[29] Fortunately, the public goods literature, as well as broader literatures in psychology, marketing, economics, and political science, suggest marketing and product design strategies to do just that.

Building on the work of Wiener and Doescher (1991), Rothschild (1979), and Bloom and Novelli (1981), this section identifies four practical mechanisms that, by adding nontraditional private benefits or by changing the structure of the public goods dilemma, might be used by marketers to increase demand for their renewable energy products. Some of the specific implications of each of these mechanisms for green power programs are described, and their use by marketers is highlighted in an anecdotal fashion. These anecdotes are intended to provide some limited evidence of the use of the recommended marketing strategies by green power marketers. Nevertheless, it must be

[29] Beyond the public goods theory itself, at least three pieces of anecdotal evidence suggest that free riding should be of concern to green power marketers. First, actual participation in existing green pricing programs is far lower than stated WTP as expressed in surveys and market research. One of the potential reasons for this divergence is that there is no incentive to free-ride in a hypothetical situation (i.e., a survey) but there may well be significant free riding when faced with an actual green product that provides public goods (Rose *et al.* 1997, Poe *et al.* 1997). Second, when asked whether they prefer voluntary individual contributions to renewable energy or a mandatory (collective) program in which all must pay, a number of customers prefer the latter approach. For example, given a statistical sample of seven utility service areas, Freeman (1996) reports that, in six out of seven cases, customers preferred the mandatory approach over the voluntary one, but by close margins. Third, based on some of the more comprehensive market research conducted to date, the Public Service Company of Colorado segmented their residential customers into three groups. The most ardent supporters of green power (39% of customers) were generally found not to care about "environmental" free riders, but a large segment of the population (36%) was found to be deeply troubled about program free riders (Baugh and Byrnes 1994).

acknowledged that the application of these public-goods concepts to the green power market is exploratory in nature. Further work will be required to more thoroughly critique the strengths and weaknesses of the public goods literature as it applies to green product markets and to assess the use, effectiveness, and sustainability of these marketing strategy propositions. Finally, though all of the strategies discussed here apply concepts that are derived from either the narrow and/or the extended version of the public goods theory and literature, one will recognize that some of the same strategies are also applicable to the marketing of traditional, private goods. Where this is the case, the claim made in this chapter is simply that these strategies may be particularly important in the sales of green products because of the confounding impacts of the public-goods contribution problem.

3.3.1 Take Advantage of Community and Social Dynamics

A number of authors have suggested that increased communication in conjunction with reduced group size can boost contributions to public goods. For example, in an experimental setting, Dawes (1980), Isaac and Walker (1988b), and Isaac *et al.* (1985) demonstrate that nonbinding communication among a small number of individuals can reduce free riding. In effect, in small group situations, individuals are able to establish implicit contracts among themselves and exert social pressure so that the "nonbinding" contract is followed. As group size increases (beyond 10 individuals), however, the economic literature generally concludes that communication will not alleviate free riding because efforts to coordinate contributions and attempts to "punish" free riding become more difficult. Olson (1965), for example, argues that, absent a central authority or other significant inducements, large groups are typically unable to provide themselves public goods. Though Olson (1965) recognizes the possibility for social, psychological, and moral pressures to increase contributions, these elements are downplayed except in small group situations.

Ostrom (1990, 1998), on the other hand, suggests that, even in large group settings, communication, social sanction, and decentralized cooperation for public goods occur more frequently than is often assumed, and she documents multiple cases of collective management of common-pool resources. More generally, authors such as Granovetter (1985) have taken issue with the undersocialized or atomized-actor explanations of neoclassical economic theory, which are claimed to underestimate the importance of social norms even in large-scale settings. Ultimately, however, even Ostrom (1990) admits that the effectiveness of communication and community sanction are affected by group size. Others note the "distancing" and dislocation that occur as markets and economies grow, and argue that, at a certain point, these effects inhibit communication and community structure (Princen 1997, Norgaard 1995).[30]

Numerous studies have attempted to identify and profile environmentally motivated customers based on demographic, socioeconomic, cultural, personality, and attitudinal variables (e.g., Schwepker and Cornwell 1991, Granzin and Olsen 1991). Many of these studies have found that individuals who are less alienated from their social world and are more involved in community affairs are also more likely to participate in environmentally responsible behavior, and that interpersonal influence is linked to consumption-related behavior.

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[30] Indeed, unlike common-pool resources managed by small, close-knit communities, one might expect demand for green products to be low because of the spacial and temporal scale of the activity and the large transaction costs required to organize collective action in such cases.

The general findings of this literature demonstrate that size, social pressures and status, and communications strategies matter, and suggest three specific recommendations to marketers on how they might increase customer demand for their green energy products. First, green power programs are likely to be more successful when they appeal to a sense of community and can rely on implicit or explicit social norms and values. Locally sited, visible projects, and community-based marketing should be considered. Messages that emphasize the collective harm that environmental problems cause and the need for everyone to work together to help solve the community problem should be used wherever feasible (Granzin and Olsen 1991). Traverse City Light and Power, a small utility in Michigan, successfully used community-based marketing to build a wind turbine that is visible from town. The community enthusiasm for and success of Traverse City's green pricing program supports the general idea that local and community-based programs may do well.

Second, an important extension of this logic is that local subsidiaries may be more successful at green marketing than multi-state or multi-national corporations seen as having little interest in the community. If this is true, larger companies may want to consider decentralizing their green marketing efforts. Though companies must trade off these benefits with the potential loss of corporate brand identity, a local, renewables-only subsidiary might be most successful.

Third, wherever possible, marketing messages and product positioning should be targeted to the most effective forms of social pressure and social norms. A number of consumer segments, each with a different level of environmental commitment and a different set of motivators, have been identified (Ottman 1993). Some of these individuals will be inspired to purchase green energy by the environmental and other benefits of their action (i.e., true altruism). In these cases, marketing messages might be best targeted to the seriousness of the environmental problem and to the benefits of individual action. Other individuals may be more influenced by the possibility of recognition in the local community, by gaining the approval of others, and/or by knowing who else is contributing (i.e., status and peer pressure); marketing messages and product positioning should be targeted accordingly. A final group of individuals may be guided by a feeling of guilt over their contribution to environmental ills, and marketing messages might emphasize the personal responsibility each individual has in improving the state of the environment. A mixture of marketing messages and product offers will therefore be required to maximize residential and business customer purchases of or donations to renewable energy, and careful market research can help refine product communications strategy.

3.3.2 Assure Customers that They Can "Make a Difference"

Voluntary contributions to public goods can often be increased if individuals feel that their own participation is pivotal to the provision of the good. Because of this, public goods contribution programs are often conducted under the condition that the good will only be provided in the event that a certain minimum level of funding is surpassed. If this minimum aggregate contribution level, frequently called a *provision point*, is not met, participants are often refunded their contribution. A combination of provision points and refunding mechanisms (also called a give-back option) can increase the incentive-compatibility of public goods provision and increase voluntary willingness to pay because these mechanisms eliminate the risk that customers will "waste" their money if the provision point is not met. Moreover, potential contributors face a risk that failure to contribute will result in the complete absence of the public good and each contributor may therefore perceive himself or herself as potentially pivotal to the provision of the good. Finally, equitably reimbursing contributors if total contributions *exceed* what is necessary to fund the project may be another way to reduce free riding. Alternatively, money collected in excess of the provision point could be used to "extend" benefits and therefore increase the production of the public good (Rose *et al.* 1997).

The game theory literature has evolved over time, but generally supports the incentive-compatibility of the provision-point/give-back combination (Palfrey and Rosenthal 1984, 1988, Bagnoli and Lipman 1989). An experimental assessment of provision points by Isaac *et al.* (1989) finds that a provision point alone can increase contributions toward public goods, but that contributions decline rapidly with repetition. Provision points combined with give-back options, however, are shown by the authors to increase contributions to 90% of the socially efficient level and the normal decay of the aggregate contribution level appears to be eliminated by the give-back option. The provision-point/give-back combination does not always perform this impressively, however. For example, if meeting the provision point does not require contributions by all participants, as would typically be the case for green power programs, then the provision-point/give-back combination may provide a smaller incentive to contribute toward public goods.

Rose *et al*. (1997) and Poe *et al.* (1997) report the results of a field experiment and a laboratory investigation intended to specifically test the effectiveness of the provision point, give-back, and reimbursement mechanisms in the context of a utility-run green pricing program. In the field experiment, only 16% of the individuals indicated that the provision point increased their interest in the green pricing program. The give-back option, on the other hand, was widely favored; 46% of the respondents indicated that this attribute increased their interest. Despite these results, econometric analysis of the actual behavior of the subjects suggests that interest in the provision point is a significant explanatory variable in participation decisions, whereas interest in the give-back option is not a significant explanatory variable. In their laboratory investigation, Rose *et al*. (1997) find that, while demand revelation is not perfect, the provision-point/give-back/extended-benefits combination results in nearly the efficient-contributions level.

These general findings suggest the following for green power marketers. First, wherever possible, green power marketers should utilize provision points, give-backs, and reimbursements in program design. Provision points and give-back options would be most appropriate in donation-based green marketing programs and for situations where a specific level of customer demand is necessary for the construction of or contract with a renewable energy project. In these cases, the provision-point/give-back combination should be strongly considered; customers should be assured, for example, that if sufficient funds are *not* obtained to build a specific project, their contributions or premiums will be given back. Moreover, if contributions or customer demand *exceed* the amount needed for the specific project, green marketers should assure their customers that they will be reimbursed equitably or that additional renewable energy will be supported (extended benefits). Consistent with these recommendations, a number of green pricing programs pledge refunds if a given contribution level is not reached, and others will refund contributions if they exceed a pre-specified level. Experience with these devices in the green power market is too limited, however, to determine their overall effectiveness.

Second, and on a more general level, if individuals are to contribute toward a public good, any mechanism that is used to emphasize the effectiveness of individual action in protecting the environment may increase customer demand. Schwepker and Cornwell (1991) and Ellen *et al*. (1991), for example, find that "perceived customer effectiveness" contributes significantly to the prediction of many pro-environmental behaviors. These studies suggest that product promotion strategies that recognize that an individual can, by his or her own efforts, improve the environment can be effective. Wiener and Doescher (1991) further advise marketers to use appeals that give individuals a sense of leadership, that is, the impression that they can lead their community. Marketing messages that emphasize (or even overstate) the marginal impact of an individual's investment in a public good *and* the importance of the collective cause are common and, despite theoretical prescriptions to the contrary, experimental assessments (Isaac and Walker 1988a) and practical experience (Walsh and Warland 1983) show that customers do respond to these variables.

Third, it is also critically important that customers feel that their dollars are being managed credibly and are being used to support renewable energy projects. A fundamental tenet of economic theory is that, when certain conditions are satisfied, profit-seeking firms will supply goods and services efficiently. Some of the most important of these conditions are that consumers can, without undue cost or effort: (1)

make reasonably accurate comparisons of the products and prices of different firms before the purchase is made; (2) reach a clear agreement with the chosen firm concerning the goods and services that the firm is to provide and the price to be paid; and (3) determine subsequently whether the firm complied with the resulting agreement and obtain redress if it did not (Hansmann 1980). One can easily see that these conditions may be unmet when dealing with green power. In this case, a particular type of market failure has occurred, what Hansmann (1980) calls a "contract failure," and customers will under-consume the good. To reduce this principal-agent problem, enhance credibility, and increase customer participation in green power programs, marketers should consider: (1) alliances with environmental groups; (2) customer advisory boards; (3) disclosure of fuel mix and emissions; (4) certification or endorsement by third-parties; (5) annual reports on the status of the program and use of funds; (6) visible community-based projects with clear environmental benefits; and (7) product-related programs rather than donation-based ones. Though individual green marketers and utilities have considered all of these mechanisms, continued work to improve credibility and increase customer trust are necessary, especially as retail competition is introduced.

3.3.3 Emphasize Customer Retention

In experimental settings, two of the most important determinants of free riding are repetition and experience (Davis and Holt 1993). Repetition refers to the iterative process of contributing where contributions are made not once but repeatedly over time. Laboratory experiments generally show that, in a single-shot game, 40-60% of individuals are willing to contribute to the public good, but that contributions decline with repetition, and sometimes dramatically. For example, in five sessions reported by Isaac *et al.* (1985), average contribution rates declined from 38% of the efficient contributions level in the initial period to 9% in the terminal period. As detailed by Andreoni (1988), it is not entirely clear why contributions decline with repetition. One hypothesis is that these reductions may come from "learning" effects. That is, participants may learn that free riding is more profitable only after observing several instances of free riding by others and becoming disenchanted by their uncooperative behavior. Perhaps for the same reason, Isaac *et al.* (1984) report that when participants are experienced with the contribution mechanism (i.e., have played the game before), free riding increases.

It is not yet clear whether repetition (and learning to free ride) will tend to reduce customer participation in green power programs over time. Customer retention is important for all types of goods, however, and the literature suggests that retention may be *especially* difficult when public goods are involved. This has two potential implications for program design.

First, green marketers may want to consider urging or requiring customers to make longer-term commitments to the program. If customers are given the option to participate or not participate on a monthly basis as might be the case under traditional electric utility billing cycles, repetition and learning effects would be exacerbated. Although one would not expect to be able to persuade many residential customers to sign extremely long-term (> 3 years) commitments for the supply of renewable energy, shorter-term commitments (several years or less) could *perhaps* be imposed without a significant loss of customer interest. Trade-offs with customer acceptance and flexibility must be carefully weighed, of course, but by establishing a longer-term commitment, repetition is reduced and the opportunities to "learn" to free ride are diminished. A number of utilities are already using customer contracts (up to three years for residential customers) to reduce the participation risk in their green pricing programs (Wiser and Pickle 1997a). In markets with retail competition, however, most suppliers place few restrictions on customer switching, presumably to provide incentives for product trial by reducing customer risk. Nonetheless, some suppliers do require a longer-term commitment through 1-3 year contracts.

Second, customer retention must be a top priority. It is critical that marketers not only expand their customer base, but also maintain an ongoing relationship and marketing presence with their existing customers and be constantly vigilant of defectors that learn to free ride. To counter the tendency to defect, green marketers may want to offer staged private rewards to long-term customers. For example, if a customer purchases green power for a year, offer that customer one free week of electricity; after the second year, offer the customer discounts on environmentally preferable products and honor the customer through public recognition. Marketers should also continually inform their existing customers of how their own personal commitment (and the commitments of other participants) is making a positive impact on the environment. Unlike urging or requiring customers to make long-term contractual commitments to the program, positive inducements and communications of this type do not provide fundamental disincentives to participate.

3.3.4 Enhance Material Private Value

Only the "greenest" of consumers will be satisfied solely with an opportunity for altruism. Therefore, the bundling and joint production of private goods with public goods may greatly increase the degree to which individuals will voluntarily contribute (Cornes and Sandler 1986). Olson (1965) notes the importance of private value for large organizations providing a public good, writing, "large organizations that are not able to make membership compulsory must also provide some noncollective goods in order to give potential members incentive to join." Though some of the previous sections of this chapter have emphasized the importance of nontraditional private value (i.e., take advantage of community and social dynamics), this section focuses on the bundling of more material and tangible forms of private goods.

Based on the importance of material private value, the key recommendations for green power programs are threefold. First, wherever possible, green marketers should bundle features that add private value beyond the public benefits that renewables can provide. For any individual customer, marketers should increase the value of the private goods with the size of their donation or renewable energy purchase, therefore providing a positive inducement to customers to maximize the size of their contribution. Moreover, wherever possible, green marketers should make the environmental benefits of their products as personal as possible; for example, appealing to personal health rather than general reductions in air pollution levels. In point of fact, most green products are sold only in part based on their environmental and other public benefits (Ottman 1993).

Product qualities such as price, quality, convenience, and personal health are often emphasized first.

Consistent with this recommendation, some green power marketers have been innovative in supplying material forms of private value to their customers. Examples have included: (1) price stability on the renewables-component of electricity purchases; (2) stickers, decals, and other promotional and/or informational material; (3) membership kits including discounts on environmentally preferable products; (4) matched donations to local environmental projects; (5) tree seedlings and bird feeders; and (6) energy efficiency products and services. Business customers, in particular, may secure private value from the promotional material and recognition offered by the green marketer, which can improve the business's image and therefore increase sales and improve employee morale. A recognition program that includes stickers and other display items, and newspaper ads featuring a list of business participants, should be considered by green marketers.

Very little market research on the value of bundling these ancillary products and services is publicly available. However, Osborn (1997) reports the results of market research conducted by the Sacramento Municipal Utility District. Customers were asked if they were willing to pay a 15% premium for electricity generated from rooftop photovoltaics; 26% of the general population responded affirmatively. However, when offered the same product but with rate stabilization (i.e., a guarantee that electricity prices will not vary), a full 49% of the population expressed interest. Clearly, bundling private goods with public goods represents an important way of increasing interest in a green product, and price stability may be a particularly valuable private good.

Second, green marketers should be product-oriented (emphasizing that this is a premium product, not solely a social program) and green products should be as tangible as possible so as to increase perceived private value. The limited evidence that exists suggests that a program based on paying a premium electricity rate for renewably-generated electricity (product orientation) elicits a higher monthly financial commitment than programs asking for optional donations (social program orientation) (Farhar and Houston 1996). Because customers seem to like the flexibility that the donation approach provides in the level of financial commitment, however, a number of green pricing programs are now offering renewable electricity in blocks (i.e., individuals can purchase 25%, 50%, 75%, or 100% of their power from renewables). Though this approach maintains the product focus and longer-term customer contracts are possible, it allows flexibility in the level of financial commitment. As further evidenced by existing programs, tangible rooftop or community-based photovoltaic systems and local wind projects are likely to be more attractive to customers than purchases of unspecified renewables from another state because they provide visible proof of the customer's own personal commitment. In fact, this type private good is particularly useful as it also plays into the community and social value dynamic described earlier.

Third, marketers should also explore offering an array of green services and products, each of which may have a different mix of private and public attributes that appeal to different market segments (Weijo and Boleyn 1996). For example, one product offering could include rooftop photovoltaics and price stability, whereas another could include renewable power purchases and discounts on environmentally preferable merchandise. By developing a product line, a marketer will be able to expand and segment their total market and may be more successful at positioning and marketing their products to a range of residential and business customers. In fact, though early experiments with green power programs typically emphasized a single product, marketers are now beginning to offer a wider diversity of products and services.

3.4 Policy Implications

Green marketing is believed by some to present an important new opportunity for renewable energy. In view of the difficulties that often arise in the private provision of public goods, however, green power marketers (and all green product marketers for that matter) should have an interest in overcoming the public goods "dilemma" in order to increase customer demand for their products. Using the literature on public goods, free riding, and collective action as a guide, this chapter has identified a number of relatively simple mechanisms that might be used to do just that, and has provided anecdotal evidence of the use of these strategies by marketers. By boosting customer demand for renewables, these strategies may help individual green power marketers succeed, and may increase the overall success of green marketing as a market-based vehicle for supporting renewable energy and providing public goods.

That said, even where marketers avail themselves of these strategies, economic theory still suggests that individuals will face strong incentives to purchase electricity on a least-cost basis and free-ride on the public benefits that can be provided through the use of renewable energy. Therefore, while the strategies described in this paper may help increase support for renewable energy, they are unlikely to eliminate the public-goods market failure and "solve" the free-rider problem from a societal perspective. Therefore the following question remains: Does the establishment of green markets obviate the need for explicit public policy support for renewable energy? Unfortunately, the answer to this question is impossible to establish prima facie, and difficult (and perhaps impossible) to establish empirically. Moreover, economic theory can only provide some of the answers because there remain noneconomic rationales for government intervention (Norgaard and Howarth 1993).

The theory of market failure provides the traditional neoclassical economic rationale for government involvement in markets (Fisher and Rothkopf 1989, Harris and Carman 1983). Proponents for public policies to support renewable energy often start with the presumption that the market alone will not produce socially desirable levels of renewables generation (Rader and Norgaard 1996). At least three types of market failures are typically offered to support this premise: (1) uninternalized public goods and externalities associated with environmental costs, research and development, and fuel price and supply risks; (2) non-price market failures such as imperfect information that prevent markets from operating effectively; and (3) existing price distortions related to unequal tax treatment and subsides provided to traditional forms of electricity generation. Within this framework, it would be imprudent to rely exclusively on green consumerism as a substitute for more overt forms of public policy (Wiser *et al*. 1997).

Opponents of renewable energy policies often contend that, despite the potential for market failures, the private market will provide a closer approximation to socially desired outcomes than policy approaches. Government intervention is not costless, after all, and the institutions that seek to correct market failures are frequently imperfect (Harris and Carman 1986). With this perspective, green power marketing may be viewed as providing a market for renewables that is large enough to eliminate the need for continued policy support. Others oppose renewables policies because they believe that there are better ways to address the underlying market failures than through technology-specific support (e.g., through pollution taxes, government R&D, and the removal of subsidies), or that the market failures are already corrected through existing policies and regulations.

The goal of this chapter is not to resolve this debate, and more research on the role and rationale for renewables policy is warranted (Wiser and Pickle 1997b). It must be recognized, however, that as part of the electricity restructuring process, public policies have or are being developed to help create new markets for renewable energy (Wiser *et al.* 1996, 1997). Two general sets of policies have received significant attention, each of which has a slightly different objective. The first set of policies works within existing market institutions to help the customer-driven green power market succeed. For example, a requirement on electricity marketers to provide fuel source and air emissions information to end-use customers targets the information market failure and would facilitate the comparison of competing green claims. Other policies of this ilk include: (1) publicly funded education on renewable energy; (2) consumer protection and truth-in-advertising laws; and (3) certification of green power providers. Many of these efforts involve a minimum of regulatory intervention, and government policy is confined to enhancing information and customer choice. Another set of policies is more interventionist in nature. These policies are intended to supplement existing market institutions or create an entirely new market, and include: (1) a renewables portfolio standard, which would require all retail electric suppliers to purchase a certain percentage of renewable energy; (2) a system-benefits charge, which would impose a volumetric surcharge on electricity rates to provide support for renewables; and (3) government-funded research and development.

None of these options are mutually exclusive, of course, and if one is persuaded that public policy is justified, it is difficult to not also be persuaded that combinations of mechanisms are likely to be more effective than any single policy in isolation. Regardless of which policies are ultimately chosen, however, designing an effective interface between private-sector green power marketing activity and government-funded renewable energy support programs requires attention. Chapter 5 of this dissertation addresses this issue in detail. Specifically, policies might be thought of and designed to complement and perhaps even cultivate the customer-driven green power market (Wiser *et al*. 1996). After all, given the marketing strategies described in this paper, end-use customer demand may arguably be able to provide a market for renewables and may ultimately demonstrate that market forces can play some role in harnessing support for and contributions to the public benefits that renewable energy can provide.

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Chapter 4

Understanding Non-Residential Demand for Green Power[31]

ABSTRACT

The use of voluntary programs to encourage pollution reduction among industry has become increasingly popular. But why would such organizations voluntarily opt to reduce pollution at a cost? While most attention has been placed on residential demand for green power, approximately 25% of all green power sales to date have come from business, governmental, and non-profit organizations. This chapter presents the results of the first large-scale mail survey of *non-residential* green power customers in the U.S. The survey explored the motivations, attitudes, and experiences of 464 business, non-profit, and public-sector customers that have voluntarily opted to purchase – and frequently pay a premium for – renewable electricity. Particular attention in this chapter is paid to the motivations of these early adopter organizations in purchasing renewable electricity, and my findings are compared to the extant literature on the motivations of firms to voluntarily exceed environmental regulations. Perhaps the most interesting contribution of this research comes in its demonstration of the importance of "altruism" as a motivator in non-residential green power purchases among early adopters. This finding, and the further discovery that the principal non-altruistic motivation for purchasing green power

[31] In the course of this dissertation research, a version of this chapter was published in *Energy Policy*. It is reproduced (with some changes) here with permission from Wiser, R., M. Fowlie and E. Holt. 2001. "Public Goods and Private Interests: Understanding Non-Residential Demand for Green Power." *Energy Policy*, 29 (13): 1085-1097.

is employee morale, differs from the predictions of the extant literature. Results of this study should be of value to marketers trying to meet the needs of non-residential customers, to policymakers interested in fostering and understanding non-residential demand for green power, and to academics pondering the motivations for firms to engage in such voluntary environmental initiatives. Importantly, the findings presented here also caution against relying significantly on voluntary green power demand by non-residential customers in meeting environmental objectives.

4.1 Introduction

4.1.1 Green Power Markets

The introduction of customer choice in electricity markets worldwide brings with it the possibility of a green power market in which end-use customers volunteer to pay a premium for renewable electricity.[32] With only a couple years of evidence to rely upon, experience with green power marketing is limited. Green marketing activity continues to grow in the United States, Europe, and Australia. But, while niche markets for green power clearly exist, few programs have exceeded 5% penetration in the residential market. In the U.S., for example, as of mid-2001, 40% of households had access to one or more green power products but less than 1% of those households had purchased green power.

[32] In the United States, green power is offered to customers by regulated utilities and - in those markets open to retail competition - by competitive green marketers. About 80 regulated utility programs are now offered in U.S., within which utility ratepayers are given the opportunity to pay more on their electricity bills to support renewable energy. Meanwhile, in the markets open to retail competition, a number of competitive marketers offer a range of renewable energy products, typically sold at a premium.

Some analysts have argued that the relatively slow rate of green power uptake should come as no surprise. The high cost of marketing, unfavorable regulatory rules, the intangible nature of green power, and the prevailing lack of consumer awareness of the environmental impacts of energy production are frequently identified as barriers to adoption. Perhaps the most significant limitation to the long-term success of the green market, however, is the contention that individual consumers act to maximize their own well being, and not the well being of society at large, when making product choices. After all, when public environmental benefits are involved, the familiar economic concept of free riding would be expected to limit voluntary, individual contributions for the betterment of the public good. While individuals may value environmental goods and be willing to pay collectively for those goods, if neoclassical-economic rationality prevails over the decision making of electricity consumers it appears that the voluntary, green power market will be severely limited (Rader and Short 1998, Wiser 1998).

More optimistic observers contend that green power marketing may offer a significant opportunity for renewable energy in the long term (Nakarado 1996). After all, there is empirical evidence in other markets that suggests that individuals and organizations do not always act in their own narrow self-interest. Instead, individuals and organizations are sometimes willing to voluntarily contribute towards public environmental benefits through their own behaviors (e.g., recycling) or purchases (e.g., green consumer products). Experimental evidence also shows that individuals frequently contribute more towards public goods than predicted by traditional economic models (Andreoni 1995).

For the most part, consideration of such non-economic motivations has focused on residential households, hence motivating the current focus of many green marketers on the residential marketplace. A standard presumption of neoclassical economics is that businesses make purchase decisions based purely on economic gains and are unlikely purchasers of green power and the public environmental benefits that accrue with such purchases.

Notwithstanding these claims, however, an interest in non-residential green power sales has emerged. Limited market research shows that up to 60% of businesses indicate a willingness to pay more for green power (Farhar 1999, Farhar and Houston 1996, Hoefgen 1999). More persuasively, where green power programs have targeted non-residential customers, those customers have often constituted over 20% of total sales (Wiser, Bolinger and Holt 2000). Some therefore believe that non-residential purchasers of green power could conceivably make substantial contributions to overall green power demand.

4.1.2 Research Objectives

The principle purpose of this chapter is to explore the non-residential market for green power, which encompasses business, public sector, and non-profit organizations. Though numerous studies have investigated the green power preferences and motivations of residential customers, publicly available research focusing on the non-residential market is limited (see, e.g., Holt 1997, Kalweit and Peterson 1999). To build and expand upon existing work, and to deeply explore customer motivations, I chose to implement the first large-sample mail survey of actual non-residential green power customers in the United States: 464 such customers were surveyed through the work reported here.

While the survey queried customers about a range of issues associated with their purchase, in this chapter I focus almost exclusively on those results that relate to customer motivations in purchasing – and typically paying more for – renewable electricity. My interest in customer motivations derives from both theoretical and practical considerations:

- **From a theoretical perspective,** I wish to add to an emerging strand of empirical and theoretical literature that asks why a firm – presumably driven by profit motivations – would choose to exceed environmental regulations. Insofar as non-residential customers are volunteering to pay extra for their electricity in order to lend financial support to renewable energy generation, the purchase of a green power product is similar to other voluntary environmental initiatives in which a firm might engage. Accordingly, this chapter uses the purchase of green power as a case study for those interested in broader issues of corporate environmentalism and voluntary over-compliance with environmental regulation.

- **From a more practical perspective,** I also believe that understanding the motivations underlying current non-residential purchases of green power will be of critical use to policymakers interested in fostering and understanding non-residential demand for green power, and to purveyors of green power trying to increase and sustain demand for their product among non-residential customers. Finally, an understanding of the motivations of the early adopters of green power sheds light on the future size and scope of this voluntary approach to supporting renewable generation.

4.1.3 Organization of Chapter

The next section of this chapter provides a brief survey of the relevant academic literature on organizational motivations to engage in voluntary environmental initiatives. The section that follows reports on the survey methods used in this study and the limitations of the methods selected. The subsequent section briefly profiles respondents to the survey. The discussion and analysis then turns to the motivations of non-residential customers in purchasing green power. Related empirical results are presented that offer further insights into the motivations of survey respondents. The chapter closes with brief summary remarks and a discussion of the possible role of non-residential customer demand in supporting renewable electricity.

4.2 Why Firms Voluntarily Engage in Environmental Initiatives

Voluntary environmental agreements and environmental self-regulation by corporations are gaining increased acceptance and popularity among a variety of stakeholders, and academic interest in such voluntary environmental initiatives is increasing rapidly. While much of the existing literature in this area is either focused on individual case studies or is highly theoretical and abstract, there is also an empirical strand of the literature that explores the factors that affect the participation decisions of firms in voluntary environmental initiatives (e.g., Arora and Cason 1996, Welch, Mazur and Bretschneider 2000, Henriques and Sadorsky 1996). Because I rely heavily on this literature, both in the development of the survey instrument and in constructing a theoretical framework in which to evaluate the empirical results, I briefly summarize the findings of this literature here.

To summarize, the extant literature has identified a number of explanations for the phenomenon of organizational over-compliance with environmental regulations and the initiation of voluntary environmental initiatives. In particular, attention has thus far focused primarily on four (non-exclusive) motivations:

- efficiency gains,
- reducing the risk of future environmental regulation,
- green marketing, and
- improved public image.

Text Box 4-1 provides a more detailed discussion of these possible motivations, each of which is explored in this chapter as a possible motivator for non-residential green power purchases.

The existing empirical and theoretical literature has focused primarily on large firms, however, and the importance of each of these four motivations is premised on the belief that corporate environmentalism will only be successful if organizations believe that they will directly benefit from the resources they devote to improved environmental performance. Because the sample of non-residential green power purchasers in this research included many small firms (much smaller than those typically considered in the existing literature), I hypothesized that, in addition to those motivations identified above,

Text Box 4-1. What Motivates Firms and Institutions to Voluntarily Exceed Mandatory Environmental Standards?

Efficiency Gains: Industrial ecology and related literatures in corporate environmentalism stress that – in many instances – voluntary pollution reduction can be accompanied by higher resource productivity or improved product quality, particularly in an industrial or manufacturing context. In such circumstances, firms' voluntary contributions to a healthier environment may be motivated by cost minimization (e.g., Porter and van der Linde 1995, Monty 1991, Walleye and Whitehead 1994, O'Rourke, Connelly and Koshland 1996, Romm 1994, Lober 1998).

Reducing the Risk of Future Regulation: A growing body of literature considers an organization's decision to volunteer as an attempt to pre-empt or affect the design of more stringent environmental regulation (e.g., Sergeson and Miceli 1998, Henriques and Sadorsky 1996, Barrett 1991). Under this model, firms voluntarily commit to environmental improvement with the underlying objective of either achieving reductions in regulatory scrutiny – possibly in an area unrelated to the voluntary activity – or influencing the scope of the regulations to provide competitive advantage to the firm. Accordingly, studies have found that voluntary commitments may be less likely where the threat of regulation is small and/or where the firm has greater bargaining power than the regulator (Segerson and Miceli 1998, Welch, Mazur and Bretschneider 2000).

Green Marketing: With high levels of environmental concern among consumers and an ever increasing number of green products entering the market, an important potential motivation for voluntary environmental commitments is the desire to differentiate products based on their environmental attributes and therefore gain new customers and build the loyalty of existing ones through green marketing (Arora and Gangopadyay 1995, Ottman 1998, Kirchhoff 2000).

Improved Public Image: Closely related to green marketing considerations are more general attempts by organizations to manage the public perception of their environmental performance (Arora and Cason 1996). While it is difficult to assign a precise monetary value to a good reputation, it is nevertheless perceived by both public and private sector organizations as being important to maintain. Perhaps the most tangible economic gains (and losses) associated with a firm's reputation have been documented by changes in capital market valuations resulting from environmental disclosures (Konar and Cohen 1997, Austin 1998, Khanna, Rose and Bojilova 1998).

two additional motivations – mentioned, but not emphasized to the same degree in the existing literature – could prove significant:

- Employee Morale: I hypothesized that some organizations may derive value from and therefore be motivated by improving employee morale and enhancing their ability to recruit top college graduates. Though relatively little emphasis has been placed on this motivation in empirical work, improving employee morale through enhanced environmental performance has been identified in case studies and surveys as possibly an important motivator of corporate environmental initiatives (Smith 1994, Fri 1992, Henriques and Sadorsky 1996).

- Altruism: I further hypothesized that some organizations may simply be motivated by altruism, driven by a desire to maintain their civic responsibility and a strong organizational commitment to the environment rather than by economic gain. In studies of the voluntary environmental contributions of individuals and of interest group participation more broadly, altruistic motivations are frequently mentioned as being a key motivator (e.g., Vining, Linn and Burdge 1992, Knoke 1988). There has been less attention paid, however, to the potential role of altruism in the decision making of non-residential customers generally, and businesses in particular (see, e.g., Weaver 1996). Though the impact of managers' environmental values is sometimes mentioned in the environmental marketing literature, altruism as a key motivation is dismissed by other observers of corporate environmentalism (Fri 1992) and traditional models of firm behavior assume a profit-maximizing firm that cares little for purely altruistic investments. Despite a dearth of empirical evidence, I suspect that admitting that altruism exists among individuals who work within organizations, but failing to consider altruism as a potential motivation for organizations themselves, is premature (Walley and Whitehead 1994). Accordingly, I view altruistic concern for the environment as worthy of empirical investigation and in need of further attention in the theoretical literature.

4.3 Methods

To investigate non-residential customer motivations in purchasing green power, I chose to implement the first large-sample mail survey of non-residential green power customers in the United States. The survey explores the relative importance of the six motivations identified earlier in the purchasing decisions of non-residential green power customers. This is done, in part, by directly questioning customers about the motivations behind their purchases, and statistically analyzing how stated motivations vary with various customer characteristics. I also benchmark these results with answers to other, more indirect survey questions that shed light on customer motivations. These questions relate to: (1) the degree to which non-residential customers have attempted to extract private value from their purchases, (2) the product and supplier selection criteria that these customers used in selecting particular green power products and suppliers, and (3) the preferences of non-residential green power customers for different ways of supporting renewable energy.

One other important methodological point deserves mention: this survey was distributed to early-adopters of green power among the non-residential customer segment. As such, results of this survey cannot be easily extrapolated or compared to the motivations of the vast majority of organizations in the United States that have not yet purchased green power. This work therefore focuses on the motivations of early adopters, and does not attempt to extrapolate the findings of the survey beyond the survey sample itself.

4.3.1 Survey Procedures and Sample

The target population of the survey was non-residential customers (encompassing business, public sector, and non-profit organizations) in the United States that were paying a premium for green power. This includes two population groups:

1. customers purchasing an optional green power service from a green pricing program offered by their local regulated utility, and
2. customers in restructured markets (California and Pennsylvania) purchasing a green power product from one of several competitive electricity marketers.

The sample population was compiled with the cooperation of regulated utilities and competitive marketers offering green power products. The two largest competitive green marketers agreed to participate in the survey by providing customer contact information, as did five regulated utilities that were known to have the largest number of non-residential customer sign-ups.

Geographically, the sample is diverse, containing customers from the competitive markets of California and Pennsylvania and from regulated markets in Oregon, California, Wisconsin, and Colorado. Because of subsidies available in California, some green power products have been sold at a discount. Assuming that such subsidies are unlikely to persist indefinitely and that green power will more frequently sell at a premium, this study attempts to exclude from the sample customers purchasing these products (which included approximately 40,000 non-residential customers in California).

Overall, I believe the sample population represents the larger target population reasonably well. As shown in Table 4-1, the entire sample population consists of 1,800 customers, each of which received the mail questionnaire in the spring of 2000. A follow-up reminder and additional copy of the questionnaire were sent to non-respondents of the initial mailing. Due to the limited follow-up procedures, a low response rate was expected. Though the 27% response rate is not high, given the sample population (business customers) and mail procedures (limited follow-up), I was pleased with this level of response and the 464 completed surveys returned. A copy of the survey for competitive marketer customers is provided in Appendix A. (The survey for customers of regulated utilities is similar and is therefore not reproduced in the Appendix.)

Table 4-1. Survey Response Rates

Program Type	**Surveys Mailed**	**Undeliverable or Bad Addresses**	**Completed Responses**	**Response Rate***
Competitive Marketers	1,234	44	222	19%
Regulated Utilities	566	23	242	45%
TOTAL	1,800	67	464	27%

* Calculated as: (completed responses) / (number of surveys mailed – undeliverable or bad addresses)

4.3.2 Methodological Limitations

As with any research, a number of methodological limitations challenge my ability to generalize the results of the survey. Perhaps most importantly, non-response and selection biases are expected to be especially prevalent given the low response rate to the survey, challenging my ability to generalize from the sample to the sample population much less to the overall target population. Quite possibly, those that chose to return the survey are more dedicated to the concept of green power than those that were unwilling to respond. As discussed earlier, I also acknowledge that the target population is a small one and is limited by the incipient state of the green power market. Accordingly, it is not appropriate to generalize the experiences of these "early adopters" to the larger potential market for green power among non-residential customers. Finally, an additional methodological challenge – which pervades all survey work – is that this study must rely on the stated motivations and actions of the survey respondents. For a variety of reasons, responses to surveys may or may not comport with actual practice. To reduce the risk of drawing erroneous conclusions from such responses, this chapter frequently relies on the answers to multiple questions to support the interpretations of the survey results.

4.4 Profiling the Respondents

Before describing the results of the survey on customer motivations, it is useful to begin by providing a brief profile of the respondents. As shown in Table 4-1, the split between customers of competitive marketers and regulated utilities is approximately equal, with 48% competitive marketer customers and 52% regulated utility customers.

The majority of the non-residential green power customers that responded to the survey are businesses (82%), with lesser numbers of public sector (4%) and non-profit (14%) organizations. For analysis purposes, I frequently combine the latter two categories, which in aggregate represent 18% of the respondents. Of those businesses responding to the survey, 82% report being primarily involved in retail sales and services compared to 18% that report being principally involved with primary industry, manufacturing, or wholesale trade.

Previous research investigating the participation of businesses in voluntary environmental programs has found that larger organizations are often more likely to volunteer (Welch, Mazur and Bretschneider 2000, Arora and Cason 1996). Based on the results from this survey, it is evident that non-residential purchasers of green power range from small organizations to some of the larger corporations in the United States, but that the sample is weighted more towards smaller organizations than much of the existing literature. For the purpose of further analysis, I divided the respondents into three size categories:

- The "small" category, representing 57.5% of the respondents, is classified as organizations with annual revenues or budgets of less than $500,000.
- The "medium" category spans annual revenues or budgets of $500,000 to $10,000,000 and contains 31.6% of respondents.
- Finally, the "large" category with over $10,000,000 in annual revenues or budgets is represented by 10.9% of the respondents. (Though some very large institutions are included in the sample, it is important to note that many of the organizations in this largest category are still relatively small relative to, for example, typical publicly traded firms in the U.S.).

Of those respondents that were willing to share data on their electricity expenditures, a full 80% report annual electricity expenditures of less than the national average expenditure for non-residential customers of $8,226. Several respondents have sizable electricity expenditures, however, leading to a mean annual expenditure among the respondents of $88,000, well above the national average.

To assess the perceptions of the respondents about the environmental predilections of their own customers (or stakeholders, in the case of non-profit and government customers), respondents were asked to estimate what percentage of their patrons made a concerted effort to buy green products and services. Of the respondents, 47% state that over 20% of their customers make such a concerted effort, whereas 33% report that they believe between 5% and 20% of the market they serve is environmentally oriented, and 20% state that less than 5% of their customers make such efforts.

Based on this sample, it would appear that the incremental cost of green power is relatively modest for most organizations: 69% of the respondents report that green electricity is costing them more than other available options, while 24% report that it costs them about the same and 6% claim it is costing them less. This last statistic suggests that my attempts to screen out those customers for whom green power is the least cost option were largely successful. Meanwhile, the average green premium (relative to electricity rates prior to the green power purchase) reported by non-residential customers, including those that reported receiving a discount or paying no premium, is 8.3%.[33] In aggregate, the total reported annual incremental cost of renewable energy for the respondents is $451,657. The yearly incremental cost for small organizations averages $140, compared to $997 for medium organizations and $9,030 for large organizations. Small organizations contribute only 6% of the aggregate incremental cost, compared to a 22% contribution by medium organizations and 72% for the large organizations. This last statistic shows that, while a minority of non-residential purchasers are large

[33] If weighted by total electricity expenditure, the average premium paid, (i.e., Σ $ premiums paid monthly / Σ $ monthly electricity expenditures) is just over 1%, influenced considerably by the presence of a few very large firms with modest green power payments.

organizations, these customers as a group contribute significantly more than the smaller firms in this sample.

4.5 The Motivations of Green Power Purchasers

This study considered all six of the aforementioned possible motivations for green power purchases in an effort to determine which motivations play more important roles and how stated motivations vary with customer characteristics. In this section I first report on direct survey results that queried customers on their motivations in purchasing green power, and then build a regression model to evaluate how motivations vary with customer characteristics. A key finding from these survey results is the importance ascribed by organizations to altruistic factors and a desire to build employee morale. A subsequent section of this chapter provides further support for these findings – which differ substantially from those found in the existing literature on the motivations of firms to voluntarily engage in environmental initiatives – by reporting the results of other survey questions.

4.5.1 Organizational Motivations: Summary Statistics

To most directly evaluate customer motivations, respondents were first asked to indicate the importance of several different motives in influencing their organization's decision to purchase green power (5-point scale; 1 = not important, 5 = very important). Table 4-2 illustrates the wording used to distinguish possible motivations.

Table 4-2. Motivations for Purchasing Green Power

Theoretical Motivation	Survey Description
Efficiency Gains	Lowest Cost: Green power is our cheapest electricity option
Public Image	Public Image of our Organization: Maintaining a “green” public image is important to us
Green Marketing	Catering to the Environmentally-Conscious: It is important that we accommodate the needs and concerns of our customers, shareholders, or constituents
Altruism	1. Organizational Values: Our organization feels a strong and pervasive commitment to public health and the environment 2. Civic Responsibility: We feel a responsibility to be community leaders, not just for the environment
Employee Morale	Employee Morale: Employees feel more pride in an organization that is giving back to the environment
Reduced Regulatory Risk	Reduced Risk of Future Regulation: Our voluntary actions in support of renewable energy reduce the need for further government intervention and regulation

As revealed in Table 4-3, the results differ from the existing literature on the motivations for firms to engage in voluntary environmental initiatives. First, neither efficiency gains nor a reduction of regulatory risk are ranked highly by the respondents as important motivators. Despite the emphasis in the literature on these motivations, it is not surprising that they hold limited explanatory power among my sample. After all, green power is typically sold as a premium product – efficiency gains are therefore not relevant. Nor would the purchase of green power have an obvious influence on the fate of future regulatory action, especially for the smaller firms represented in this sample.

Table 4-3. Motivating Green Power Purchasers

		Percentages (%)				
Motivation	**Mean Response**	not important 1	2	3	4	very important 5
▪ Organizational Values	4.4	2	3	9	23	62
▪ Civic Responsibility	4.1	6	5	16	24	49
▪ Employee Morale	3.4	14	10	23	25	28
▪ Public Image	3.2	21	11	22	22	25
▪ Green Marketing	3.0	24	11	22	24	20
▪ Reduced Regulatory Risk	2.6	38	13	17	15	17
▪ Lowest Cost	2.2	42	20	24	8	7

Second, and more interesting, are the remaining results, which suggest that altruistic factors (organizational values and civic responsibility) rank as the dominant motivations, followed by employee morale. (The relative emphasis on altruistic motives is further supported by evidence presented later in this chapter). Public image and green marketing, both viewed as potentially important motivators in the existing literature, are given secondary importance.[34] In contrast to the current stream of literature and its focus on those motivations that are consistent with the profit motive of firms, these results suggest that green power customers are acting on a blended set of personal and business motives. As discussed below, these results can, in part, be explained by the predominance of small organizations in my sample.

4.5.2 Factor Analysis

In an effort to gain insight into the more general motivational structure underlying purchasing decisions, a factor analysis of the rankings of the seven motivations was conducted using orthogonal (varimax) rotation. The results are consistent with my initial expectation that there would be two broad patterns of stated motivations to purchase green power: one encompassing more altruistic motives and a second oriented more towards private economic benefits. In particular, consistent with a preliminary correlation

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[34] These last results are somewhat consistent with two recent studies. In the first study, only 15% of surveyed companies "strongly agreed" that "going green" would lead to increased customer loyalty (Kalweit and Peterson 1999). In the second study, several large companies indicated that even if they were to purchase all of the green power their utility had to offer, they would be unlikely to gain public relations benefits (Mayer, Blank and Swezey 1999).

analysis,[35] results from the factor analysis confirm that motivations are organized around two relatively unique factors which together account for 45% of the variation in all variables.[36] Table 4-4 lists the factor loadings, communalities[37] and variance accounted for by each factor.

Table 4-4. Factor Loadings and Explained Variances

Motivations	Factor 1	Factor 2	Communality
Lowest Costs	*	*	.23
Public Image	*	**.77**	.63
Green Marketing	*	**.75**	.62
Organizational Values	**.78**	*	.61
Civic Responsibility	**.72**	*	.54
Employee Morale	.49	.41	.41
Reduced Regulatory Risk	*	*	.12
Total Variance Explained	22.6%	22.5%	45.1%

* Only factor loadings of 0.35 or higher are reported.

The "organizational values" and "civic responsibility" criteria are loaded heavily on the first factor. With the weightings so similar, I chose to represent these two criteria as a single "altruism interest" index by summing the ranks assigned to each. The second factor contains only two items with high loadings, namely public image and green marketing considerations. These two items also share a common theme: both relate to a tangible private value received by the organization. As with the first factor, because the loadings of these two criteria are so similar I later simply sum their ranks to obtain a

[35] The Pearsonian correlation matrix indicates high correlation between the green marketing and public image variables (r=0.64) and between the civic responsibility and organizational value variables (r=0.57). The employee morale variable is significantly correlated with all four of these variables (with all four correlation coefficients ≥0.4).
[36] If three factors are extracted, the eigenvalue of the third factor falls below 1, indicating that the appropriate number of factors to extract is 2.
[37] Communalities measure the information (in terms of variance) that a variable has in common (through the common factors) with all the other variables.

"private benefit" index.[38] Of all motivations, lower cost and regulatory risk reduction have the lowest communalities, indicating that they are not uniquely related to either factor. Employee morale loaded on both factors, suggesting that this variable contains both altruistic and private value components.

4.5.3 Regression Analysis

The results presented thus far suggest that altruism and employee morale are the dominant motives for purchasing green power among this sample. This contrasts with much of the recent literature in corporate environmentalism, which typically posits economic rationales for participation in environmental initiatives. To better understand the difference between the findings of this study and the existing literature, I examined the degree to which variables such as organization size and firm type could be used to discriminate between those that place a small amount and those that place a large amount of emphasis on the traditional "private benefits" motivations of public image and green marketing in green power purchasing.

Based on the factor analysis presented above, a linear regression model was constructed with the dependent variable a composite scale created by summing the rankings for the green marketing and improved public image motivations (the "private benefits" index, referred to earlier). Independent variables are described in Table 4-5.

[38] The correlation between the "altruism interest" index variable and factor 1 scores is .97, while the "private benefit" index variable is highly correlated with factor 2 scores (r= .96).

Table 4-5. Regression Variables

Variable	Description	Mean	Std. Dev.	Min:Max
Dependent Variable				
1. Private Benefits Motivation	Scale constructed by summing ratings of public image and green marketing motivations	5.93	2.78	0:10
Independent Variables				
1. Organization Size	Reported annual revenues or budgets of organization (6 possible categories)	1.81	1.20	1:6
2. Green Clientele	Percent of product of service sales perceived to come from customers that make concerted effort to purchase green products or services (6 possible categories)	3.96	1.56	1:6
3. First Mover Strategy	Agreement with: "being among the first to purchase green power is an effective way for a company to set itself apart" (1 = definitely true, 5 = not at all true)	2.66	1.21	1:5
4. Dummy 1: Non-Profit/ Public Sector	Dummy equals 1 if customer is a non-profit or public sector organization	0.18	0.38	0:1
5. Dummy 2: Customer Type	Dummy equals 1 if customer is being served by a competitive marketer	0.47	0.50	0:1
6. Estimated Premium/ Discount	Reported premium (reported annual premium paid/annual energy expenditures*100).	8.25	14.3	-100:104

The specific hypotheses I hoped to test through this procedure were as follows:

- **Hypothesis 1: Private value motivations will be more significant among larger organizations.** One might reasonably expect the "private value" driven motivations of public image and green marketing to play a stronger role among larger and potentially more bottom-line oriented customers. If this were the case, then my overall finding on the importance of altruism as a principal motivator might be partially explained by the relatively small size of the firms in my overall sample.

- **Hypothesis 2: Organizations with more environmentally conscious customers will ascribe higher importance to private value motivations.** It is also plausible that those organizations that believe a higher proportion of their products or services are consumed by individuals who make a concerted effort to "buy green" will also be more able to capture private value from green power purchases and will therefore be more motivated by public image and green marketing concerns.

- **Hypothesis 3: Those organizations that see strategic value in purchasing green power will be more motivated by private value interests.** Extracting material value from a green power purchase may further depend on the actions of an organization's peers (Arora and Gangopadhyay 1995, Walley and Whitehead 1994). One could make a plausible argument, for example, that being among the first to purchase green power would differentiate a firm and provide public relations and marketing benefits relative to a later purchase. I asked respondents to indicate the extent to which they felt that being among the first in their peer group to purchase green power is an effective way to set themselves apart. I hypothesize that those that believe that it is strategically important to be an early adopter of green power are also more likely to rank private-value motivations highly.

- **Hypothesis 4: For-profit companies will be more motivated by private value interests than non-profit or public institutions.** Finally, I expected that those organizations that are more profit oriented will also be more concerned about marketing and public image.

The research employed a "general to specific" approach in developing the preferred regression model, starting with a general model that included all independent variables that could conceivably help explain the variation in the response variable, and eliminating in a stepwise fashion those that were found to be insignificant. Although no prior hypotheses were made regarding customer type (retail versus wholesale) and green power premium variables, they remain in the reduced model because their inclusion was found to improve the explanatory power of the model. All data were standardized prior to the analysis so the relative magnitudes of the estimated regression coefficients could be more meaningfully interpreted. The results of the preferred model regression are presented in Table 4-6.[39]

Table 4-6: Standardized Regression Coefficients

	Private Value Motivation	
Variable	**Coefficient**	**P-Value**
Intercept	0.121	0.016
Organization Size	0.176	0.002
Green Clientele	0.215	0.000
First Mover Strategy	-0.218	0.000
D1: Public Sector/Non-Profit	0.111	0.030
D2: Customer Type	-0.137	0.012
Premium	-0.108	0.028
n = 369		

[39] To test the robustness of this model I also used the same independent variables to examine responses to the more tangible question relating to the organization's activities to "get the word out" about their purchase through press releases, secondary marketing, and the like. As the construct being tested in both models was the degree of importance ascribed to "private" value, I expected these two regressions to produce similar results. Most of the salient results of that analysis are consistent with the results presented in this article.

Though the explanatory power of the resulting model is relatively low (adjusted $R^2 = 0.22$), the results do support several of my hypotheses.

- Perhaps most importantly, the regression results support Hypothesis 1, with a statistically significant and positive regression coefficient for organization size. Apparently, larger firms place greater emphasis on public image and green marketing concerns when purchasing a renewable energy product than do smaller organizations.[40]
- Similarly, the regression results support Hypotheses 2 and 3, with significant regression coefficients for both variables, showing that organizations with higher numbers of environmentally committed customers and organizations that see strategic value in purchasing green power are more likely to ascribe importance to public image and green marketing motivations.
- The regression coefficient for the organization type variable is statistically significant but is of the opposite sign than I expected. This finding implies that private interest motivations are more important among not-for-profit and public institutions than among for-profit firms. Consequently, Hypothesis 4 is not supported by these data.
- Other independent variables for which I had no prior hypotheses were also found to have some significance. For example, the results show that those paying a

[40] Not only is this finding plausible, but it is supported by a recent study that found altruistic concerns to be more likely to influence the decision making processes of smaller firms than their larger counterparts (Kalweit and Peterson 1999).

higher premium are less likely to be motivated by private interests than those paying less for green power. Furthermore, utility customers appear to be more likely to be motivated by private benefits than their marketer customer counterparts.

4.6 Further Evidence on the Importance of Altruistic Motivations

I acknowledge that the results presented above – suggesting that altruistic concerns are a dominant motivator and that private-value concerns are less prevalent, at least among the smaller firms in this sample – are subject to doubt. After all, organizations can be expected to exaggerate the importance of such altruistic concerns when asked about their motivations.

Further evidence of the importance of altruistic motivations, however, can be found in the answers of the survey respondents to other questions. I group this evidence under three areas, described below. As shown, survey results from each of these areas offer further support for the importance of altruistic factors in green power purchase decisions, at least among the early adopters that populate this survey sample.

4.6.1 Extracting Public Image and Green Marketing Value

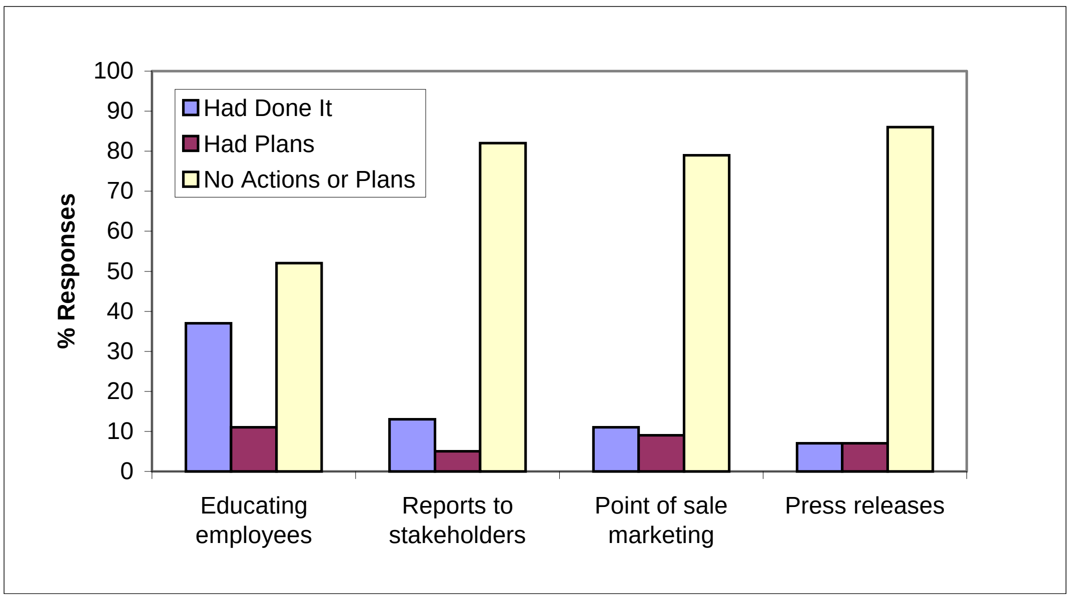
Initial support for my findings comes from a comparison between stated motivations and reported behavior. In particular, the survey asked whether the respondents' organizations had engaged in or had plans to engage in any of a number of activities to "get the word out" about their green power purchase, including:

- educating the organization's employees about green energy,

- developing point of sale marketing or public education material,
- issuing press releases announcing the green power purchase, or
- highlighting the purchase in reports to shareholders, members, or funding sources.

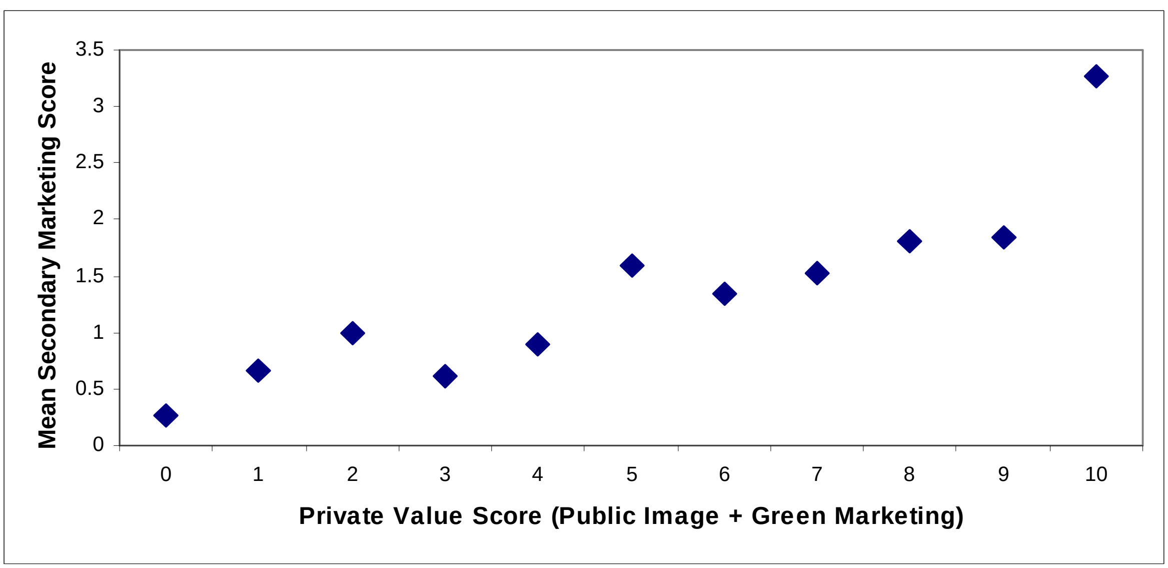
If non-altruistic concerns were principal motivators in the purchase decision, one would expect that such efforts would be commonplace. Figure 4-1 reveals, however, that with the exception of employee outreach, very little secondary marketing has taken place. Nor do the vast majority of respondents have any plans to greatly increase their efforts in these areas. These results certainly do not contradict the tentative conclusion that altruistic motives have been a principal driver to green power purchases thus far, followed by a desire to improve employee morale.

Figure 4-1: Getting the Word Out About Green Power



Meanwhile, Figure 4-2 shows that, as expected, there is a relationship between stated motivations and reported behavior: those organizations that identify green marketing and public image as being significant motivators in their purchase are also more likely to have engaged in behaviors to "get the word out" about their purchase. The horizontal axis measures the "private benefits" index discussed earlier, which is simply the sum of the rankings of the green marketing and public image motivations. The vertical axis measures the degree to which organizations engaged in secondary marketing activities on an 8-point scale: 2 points for each activity already undertaken and 1 point for each planned activity. As illustrated by the figure, those organizations that rate highly on the "private benefits" index are also far more likely to have engaged in or have plans to engage in various forms of secondary marketing to capitalize on their purchase. The fact that very few organizations have engaged in or have plans to engage in significant secondary marketing of their purchase therefore strongly suggests that green marketing and public image considerations are of secondary importance relative to altruistic concerns.

Figure 4-2. Secondary Marketing Efforts by Private Value Index Category



Nor are the respondents unhappy with their green power purchases, as one might expect if they had hoped to derive marketing value but had been unsuccessful in garnering that value. On the contrary, the survey respondents appear largely satisfied with their purchase and state a high likelihood of continuing their purchase. In particular, the survey asked the respondents whether their purchase had provided the benefits that they anticipated (5-point scale; 1 = not at all, 5 = completely). Though only 24% state complete satisfaction, 86% of customers marked a 3 or over on this response scale. Similarly, only 2.5% of respondents indicate that they are unlikely to renew their green power purchase when the current contract or commitment ends (defined as marking 1 or 2 on the 5-point response scale; 1 = not very likely, 5 = very likely), compared to 87% of customers that indicate a strong likelihood of renewal (defined as marking a 4 or 5 on the response scale).

4.6.2 Green Power Selection Criteria

Customers might use a variety of decision criteria in selecting green power suppliers and products. Additional insight into the motivations of non-residential purchasers of green power therefore comes from survey questions that queried customers on their green power supplier and product selection criteria. In particular, customers were asked to rate the importance of various criteria in their selection of a green power supplier and product on a 5-point scale, with "1" being "not important" and "5" being "very important."

Tables 4-7 and 4-8 report the results. A key finding to emerge from the data presented in these tables is that customers systematically give more importance to the environmental repute of the supplier and the environmental content of the product than other, more pragmatic possible decision criteria involving cost and convenience. These results reinforce the finding that the non-residential early adopters of green power represented in this sample are motivated more by altruistic, environmental concerns than profit-oriented concerns.

In particular, Table 4-7 shows that the socially responsible supplier criterion has the highest mean response, following by whether the supplier was easy to work with, had a good reputation, and appeared financially sound. Whether the supplier is local is of least importance overall.

Table 4-7. Rating of Various Supplier Selection Criteria (mean response on 5-point scale)

Supplier Selection Criteria	Overall Response
▪ Appears socially responsible and committed to the environment	4.4
▪ Easy to work with/understands our needs	3.7
▪ Good reputation as supplier	3.5
▪ Appears financially sound	3.4
▪ Local company	2.9

Table 4-8 reports the results of the product criteria. Overall, the percent of renewable energy is found to be the most important product-based selection variable, followed closely by whether the customers' premium is used to support new renewable energy facilities (rather than existing facilities) and the type of renewable energy included in the product (e.g., wind, biomass, geothermal, solar, etc). Price, often thought to be the most important of all criterion in product purchase decisions, emerges as the fourth most important criterion in this sample. Contract length and whether renewable generation is located in-state are significantly less important.

As also shown in Table 4-8, smaller organizations in general appear more driven by the environmental quality criteria than larger ones, with larger organizations ranking price as being relatively more important.[41] This is also consistent with the previously reported regression results, which show that the larger organizations in the sample are more driven by private benefits than their smaller counterparts.

Table 4-8. Rating of Various Product Selection Criteria (mean response on 5-point scale)

Product Selection Criteria	Overall Response	Small Orgs.	Medium Orgs.	Large Orgs.
▪ Percent of renewable energy	4.2	4.4	4.1	3.6
▪ Focus on new renewables	4.0	4.1	3.9	3.7
▪ Type of renewable energy	3.8	4.0	3.4	3.5
▪ Price	3.5	3.4	3.4	3.6
▪ Product certified by 3rd party or endorsed by environmental org.	3.3	3.4	3.2	3.0
▪ In-state renewable generation	3.1	3.0	3.0	3.5
▪ Short contract or commitment length	3.0	2.8	3.0	3.1

4.6.3 Policy Preferences

Support for renewable energy can come from one of two sources: voluntary purchases of green power products by consumers or collective public policy measures. While voluntary approaches to environmental policy have become increasingly popular in Europe and North America, collective policy measures have historically been the principal mode of support for renewable energy. Contemporary policy options include the system-benefits charge (where all electricity consumers pay more for their electricity in order to raise funds to finance renewable energy projects), the renewables portfolio standard (where all utilities and power suppliers are required to include a minimum

[41] Though the data are not shown here, I note that these trends are particularly apparent and strong among the utility customers.

percentage of renewable energy in their supply portfolios), and further pollution taxes or regulations (where pollution from electricity generation is taxed or further regulated).

The presumption of the profit-maximizing firm implies that, in most cases, firms will disapprove of or be neutral to new environmental regulations.[42] Further support for the importance of altruism in current green power purchases – and against the standard presumption of strict profit-maximization – comes from responses to a survey question that asked respondents to rate their preference for different support mechanisms, including those identified above.

If non-residential purchasers of green power were more motivated by the private marketing and image benefits than by the environmental benefits accruing to society as a whole, one would expect respondents to indicate a strong preference for voluntary approaches to supporting renewable energy. After all, private benefits cannot easily be captured in the context of mandatory support.

In contrast, when asked to register their support for different ways to encourage renewable energy development, majorities of the survey respondents preferred public policy measures to voluntary consumer choice. In particular, on a 5-point scale (1 = do not support, 5 = strongly support), the renewables portfolio standard was the most strongly supported of the options with a mean response of 4.2, followed by a pollution tax (3.9) and a system-benefits charge (3.5). Among these organizations, a voluntary approach to supporting renewable generation is the least preferred alternative with a sample mean of 3.1. Among this sample of early adopters, non-residential green power

[42] An exception to this rule occurs when, as discussed earlier, a firm believes that regulation will be created in a way that creates barriers to entry to possible competitors or otherwise provides competitive advantages to the firm.

purchasers apparently acknowledge what they believe to be a limit to the effectiveness of such voluntary programs.

4.7 Conclusions

This study presents one of the first detailed looks at business, non-profit, and public sector green power purchasers. Perhaps the most interesting contribution of this research comes in its demonstration of the importance of altruism as a motivator for non-residential early adopters already purchasing green power in the United States. This finding, and the further discovery that the principal non-altruistic motivation for purchasing green power is employee morale, differs from the emphases of the existing literature on the motivations of firms to exceed environmental regulations. This existing literature typically focuses on motivations that are tightly linked to direct economic gain by the firm, and often downplays the potential role of altruism (Fri 1992, Arora and Cason 1996). The findings presented here, however, suggest that these traditional motives are of lesser importance in understanding *current* green power purchases; instead, I find evidence that altruistic motivations extend beyond the residential market.

Two possible causes for the discrepancy between the existing literature on organizational motivations and my results deserve mention. First, the non-residential customers in my survey sample represent a very small number of early adopters of green power. While these early adopters may be motivated by altruistic concerns, my research cannot and does not imply that a large number of other organizations in the U.S. are similarly motivated. Given the few "private rewards" offered by green power providers, it may simply be that this survey has captured a limited number of true altruists; a broader set of potential green power customers may be more influenced by motives that are more consistent with the extant literature.

Second, the findings of this chapter further suggest that the discrepancy between the existing literature and my results may be driven by the size of the firms considered. In particular, the regression results presented here find that the traditional "private benefit" motivations of public image and green marketing become stronger for larger organizations. Because the existing literature focuses principally on some of the largest firms – whereas my sample includes a majority of smaller firms – it may be that altruism is a much more influential motivator among smaller organizations that are torn by both business and personal motives. This finding is intuitively plausible. Accordingly, while the emphasis of the existing literature on private benefits as drivers for voluntary environmental initiatives may be accurate for the motivations of larger firms, the conclusions presented in this paper suggest that those results may not be easily generalized to smaller sized firms such as those represented in my sample.

As an example, several studies have found that larger organizations are more likely to participate in voluntary environmental programs (Welch, Mazur and Bretschneider 2000, Arora and Cason 1996), perhaps because larger firms are better able to extract private value from such initiatives (larger companies may be better able to take advantage of economies of scale in environmental programs, for example, or they may be more often the target of external pressure). Conversely, when altruism is a principal motivator (as it is among my sample) one would expect that participation would peak among smaller organizations. This is consistent with a recent study that found that smaller businesses were more willing to pay a premium for cleaner energy than were larger firms (Hoefgen 1999).

My findings should also be of more than academic interest, and have important implications from marketing and public policy perspectives. From a practical marketing perspective, for example, the findings imply that green power purveyors may find initial success in marketing their product in an altruistic way, emphasizing the environmental and social benefits of the purchase. A further emphasis on the ways in which a purchase can contribute to employee morale and retention, a focus not presently taken by most marketers, may also attract non-residential early adopters. On the other hand, more traditional messages that emphasize the green marketing, public image, or regulatory risk reduction benefits of the purchase may not immediately activate interest among early adopters representing smaller organizations, but may be important in attracting larger businesses to consider a green power purchase. Moreover, these more traditional messages can be expected to become increasingly important as the market for green power moves beyond the small set of dedicated early adopters that can be motivated by altruistic concerns.

The fact that altruism is a principal motivator to current non-residential green power purchases, and that purchasers are apparently receiving little material private value, also cautions against relying exclusively on voluntary demand to meet what are public environmental objectives in the development of renewable energy resources.[43] The non-residential green power market is, today, a small market, and there are most certainly

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[43] This implication stands in contrast to Arora and Cason (1996), who conclude that voluntary environmental initiatives may hold great promise because the largest firms with the most toxic releases are more likely to participate in a toxic reduction program.

limits to altruism among firms. Appeals to altruism may attract early adopters of green power, but if green power is really to flourish among non-residential customers (and especially larger customers), green power providers will need to better communicate the private rewards of the purchase. If green power purveyors are unable to credibly offer such rewards, non-residential green power demand is likely to be limited principally to smaller firms willing to give up some profits to provide a public good.

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Chapter 5

The Role of Public Policy in Emerging Green Power Markets: An Analysis of Marketer Preferences[44]

ABSTRACT

Green power marketing has been heralded by some as a means to create a private market for renewable energy that is driven by customer demand for green products. This chapter challenges the premise – sometimes proffered in debates over green markets – that profitable, sizable, credible markets for green products will evolve naturally without supportive public policies. Relying primarily on surveys and interviews of U.S. green power marketers, this study examines the role of specific regulatory and legislative policies in "enabling" the green power market, and searches for those policies that are believed by marketers to be the most conducive or detrimental to the expansion of that market. I find that marketers: (1) believe that profitable green power markets will only develop if a solid foundation of supportive policies exists; (2) believe that establishing overall price competition and encouraging customer switching are the top priorities; (3) are somewhat leery of government-sponsored or mandated public information programs; and (4) oppose three specific renewable energy policies that are frequently advocated by renewable energy enthusiasts, but that may have negative impacts on the green marketers' profitability. The stated preferences of green marketers shed light on ways to

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foster renewables by means of the green market. Because the interests of marketers do not coincide perfectly with those of society, however, the study also recognizes other normative perspectives and highlights policy tensions at the heart of current debates related to green markets. By examining these conflicts, I identify three key policy questions that should direct future research: To what extent should price competition and customer switching be encouraged at the expense of cost shifting? What requirements should be imposed to ensure credibility in green products and marketing? How should the green power market and broader renewable energy policies interact?

5.1 Introduction

This chapter examines the role of public policy in developing markets for renewable energy by facilitating transactions between “green power” sellers and buyers. There is concern in some quarters that renewables (primarily solar, wind, geothermal, and biomass) will fare poorly if traditional policy measures designed to support these technologies are abandoned. To capture the social benefits that renewables can provide, some therefore advocate continuation of policy incentives targeted at renewable generators (Rader and Norgaard 1996). At the same time, electricity restructuring and the introduction of retail choice is increasing product differentiation as power marketers compete for customers. Green power marketing – selling electricity products based on their environmental attributes – has emerged as a way for marketers to attract customers (Joskow 1998). It has been heralded by some as a means to create a new, sizable, self-sustaining market for renewables that is insulated from the cycle of “on-again, off-again” renewable energy policies (Nakarado 1996). Consequently, some research and advocacy attention has shifted away from traditional policy approaches and toward the green market.

As addressed in detail in Chapter 2, experience in both regulated and deregulated contexts provides empirical evidence that a niche market for "green power" exists among electric customers. For example, about 80 U.S. utilities have launched regulated green power programs that allow customers to support renewables through price premiums or donations; up to 7.5% of residential customers participate in these programs with average participation rates of 1%. Recent experience with retail competition in the U.S. also confirms that some power marketers will offer green products in a competitive context, with similar levels of customer response (Wiser et al. 1999). Finally, green marketing is not solely a U.S. endeavor, with growing activity throughout the world (Fouquet 1998).

Despite the increase in green offerings, however, green power demand in most jurisdictions has been far lower than surveys would seem to suggest (Farhar and Houston 1996). Further, the truthfulness of the "green" claims and the environmental quality of the "green" products have frequently been questioned. An active debate therefore remains over whether green marketing can ever create a "significant" market for renewable energy. There are, it seems, a number of challenges to the emergence of a sizable, credible green market. One class of potential obstacles, removed somewhat from the "free riding" concerns discussed in other chapters, derives from the regulatory and legislative policies being established as part of electricity market reform. These policies address details ranging from stranded cost recovery and unbundling to disclosure requirements and "green power" definitions.

5.1.1 Research Objectives and Definitions

There is a growing consensus that regulatory and legislative policies will play a decisive role in both shaping the competitive electricity market broadly (Costello and Graniere 1997), and in influencing the size and credibility of the green power market specifically (Wiser et al. 1999). Some U.S. states have even expressed an interest in designing policies to specifically promote – or to at least not stifle – the green power market. However, little research has been done to systematically identify, review, or prioritize the policy decisions that might affect this market. This chapter begins to fill this research void and, in so doing, seeks to provide insights about ways to foster renewables through the green market. I focus on the following key research questions:

- What regulatory "market barriers" impede development of the green market?
- What role might public policy play in breaking down these barriers? What is the relative importance of specific "market rules" and "market facilitation efforts" in promoting renewable energy use via the green power market? Could some seemingly unobjectionable policy decisions unintentionally stifle the development of the green market?
- What are some of the important policy tradeoffs facing regulators and legislators?

<u>Market barriers</u> are defined here as regulatory or market conditions that might restrict the size and/or credibility of the green market. Competitive <u>market rules</u> are defined as the basic structural and operational rules established by regulators and

legislators as part of electricity reform that will affect all suppliers of electricity (e.g., rules related to stranded cost recovery, direct access process and timing, customer education, market power, etc.). Green power market facilitation efforts are defined as programs and policies that directly and differentially impact green power providers relative to other electricity suppliers and that may be intended to directly promote the market for green power sales (e.g., environmental disclosure, renewable energy subsidies, green power definitions, etc.). Both market rules and market facilitation efforts are forms of public policy, and both may either reduce or enhance market barriers. I distinguish between these two broad forms of policy because, as I will show, green power marketers believe that the competitive market rules should be given higher priority by policymakers than the more directed forms of green power facilitation.

For purposes of this study, I assume that increasing the use of renewable energy is a desirable social objective and that green marketing may be a legitimate (though not the only) way to proceed toward that objective. I do not tackle the question of whether there is adequate justification for supporting renewables, nor do I debate the merits of green marketing as an appropriate tool for developing renewables. Instead, I contribute to the emerging green marketing literature by addressing the questions raised above from the unique perspective of those companies attempting to build and profit from this market – the green power marketers. I rely on marketer surveys and interviews as my primary sources of data because I believe that the views of those most directly affected by policy decisions offer a useful perspective from which to evaluate the impact of those decisions on the market for green power. I also echo Knight's (Knight 1998) concern that the focus of restructuring has been "utility-centric" and that increased attention to the perspectives of competitive retail marketers is warranted. Where possible, I compare and contrast the preferences of marketers with those of the academic literature and conventional wisdom. Because the interests of marketers do not necessarily coincide with those of society, I also account for other normative perspectives and highlight key policy tensions among different interest groups. An understanding of the nature and scope of these tensions can help advocates and policymakers make decisions about programs to support renewable energy and the green market. Future work should explore the interests of other stakeholders in more detail in order to better characterize these tensions.

I begin this chapter in Section 5.2 with a discussion of the theoretical underpinnings of this work and a brief literature review. Section 5.3 then describes my research methods. Based on the results of the marketer surveys and interviews, I identify and prioritize various market barriers, rules, and facilitation efforts in Sections 5.4 and 5.5. Aspects of current regulatory policies in specific U.S. states are used to selectively illustrate the policy design issues raised. Four general research findings that emerge from the detailed survey results are then summarized in Section 5.6. Research and policy implications are described in Section 5.7, and I highlight areas of tension between the perspectives of marketers and those held by other interest groups. I offer some concluding remarks in Section 5.8.

5.2 Theoretical Underpinnings and Literature Review

In the abstract, retail competition and customer choice implies relying on the market rather than on regulation to establish the rates, terms, and conditions of electricity service. Nonetheless, most would acknowledge that some form of government intervention is needed to ensure that efficient market outcomes are achieved and that these outcomes are consistent with broad social interests. The economics literature, in particular, helps us understand the role that government regulation plays in creating and shaping markets. Below, I highlight important themes of the economics literature in this area and briefly review related research efforts on electricity industry policy. The conclusions reached here provide the theoretical basis for the current study.

5.2.1 The Economics of Markets and Market Intervention

Three important lessons for the research presented in this chapter can be extracted from the economic literature on markets and market intervention.

First, to create a competitive electricity market where one has not historically existed and to ensure that the market operates consistent with the public interest, it is not enough to simply mandate customer choice and call the market "open." Instead, though conceptions of "the market" have historically varied across disciplines (Swedberg 1994, Abolafia and Biggart 1991), there is wide acknowledgment that some form of government intervention is an inescapable element of all markets. After all, though capitalist societies emphasize private exchange as the primary method of resource allocation, markets cannot generally be found in a "state of nature" (Harris and Carman 1983). Instead, the economics literature shows that all markets exist within an institutional (Furubotn and Richer 1991, North 1991) and social (Granovetter 1985, Abolafia and Biggart 1991) environment and are defined in part by the government rules under which they operate (Williamson 1996, Norgaard 1995, Porter 1996). As noted by

Harris & Carman (Harris and Carman 1983), these rules unavoidably shape the outcomes of market transactions. The relevant question then becomes not whether there should or should not be government intervention, but rather what the nature and scope of that intervention should be. Consequently, because the electricity industry has traditionally been governed by economic regulation, the structure and operations of the new competitive market will need to be defined and interactions between regulated and unregulated industry segments stipulated. These policy decisions will clearly help shape the competition that emerges.

Second, the range of policy instruments available to encourage the green market need not be limited to the extremes of Soviet-style central planning versus unfettered free choice. Rather, a wide variety of policy options exist and attention must be directed to how alternative policies work in practice rather than to hypothetical ideals. While the traditional “market failures” framework of neoclassical economics provides only limited guidance to policymakers on when and how governments should intervene in markets, the institutional and transaction-cost economics literature provides more useful general guidance. A brief digression into market failures and transaction cost economics will help explain these conclusions.

Market failures provide the most common rationale for government intervention in markets according to neoclassical economics, and many of the competitive market rules and green power facilitation efforts identified in this chapter can be seen as ways to combat potential market failures. A market failure exists when any of a number of conditions exist: few buyers and sellers, significant barriers to entry or exit, externalities or public goods, and costly and imperfect information (Bator 1958, Samuelson 1947).

Market failures are common – pervasive, even – in the real world, however, and the institutions that seek to correct them are neither perfect nor costless themselves (Stiglitz 1989). Moreover, there is no one-to-one correspondence between the type and magnitude of a market failure and the appropriate policy response. Finally, the market failures framework is fundamentally static, emphasizing equilibrium states in mature markets rather than dynamic adjustment processes in emerging markets (Harris and Carman 1984, Nelson and Winter 1982). Consequently, this framework provides only weak guidance regarding the infinite range of policy choices that may be usefully employed in emerging markets (Friedman 1981).

Most importantly, analysis of market failures often centers on a false dichotomy between reliance on "markets" and reliance on "government" (Bowles 1991). For example, the strictest version of the public-goods, free-rider theory suggests that the private provision of public goods is untenable and that consumers are generally unwilling to pay extra for products that provide environmental benefits to society as a whole. Therefore, if the public good is to be provided, a strong government role is required. Yet, this rendering of the situation is oversimplified. Although one needs to recognize the real limits of markets when public goods are involved, a great deal of theoretical, experimental and empirical work shows that individuals, acting in a decentralized fashion, are sometimes able to provide public goods to some extent (Ostrom 1998, Wiser 1998). Ostrom (1998) therefore notes that policies designed based on the assumption that people are unable to privately-provide public goods may be less successful than those that recognize the possible marriage between markets and policies. From this perspective, a whole range of policy instruments that might enhance the opportunities for the private provision of public goods can be considered; these policies are neglected under the traditional public goods theory.

Institutional and transaction-cost economics provides a better theoretical framework for understanding the range of institutional choices that exist in the continuum between "free markets" and "strict government regulation." As noted by Arrow (1969), "market failure is not absolute, it is better to consider a broader category, that of transaction costs, which in general impede and in particular cases absolutely block the formation of markets." Transaction-cost economics, in contrast to neoclassical economics, recognizes that market transactions almost always have costs and that these costs depend on the manner in which the transactions are institutionally configured. By incorporating transaction costs, this literature does away with the neoclassical economic goal of creating a "perfectly" competitive market and an "optimally" efficient economy. The transaction-cost perspective therefore allows us to consider a wider range of policy options than are available from the perspective of market failures and "first-best" policies (Friedman 1981). The transaction-cost viewpoint also directs attention to how alternative policies actually work in practice, while the market failures analyst often disdains these real-world particulars (Coase 1992, Williamson 1996). Within this framework, and as recognized by Coase's (1960) seminal work, the goal of government is, in part, to configure market institutions to minimize transaction costs consistent with overall social objectives.

Third, and finally, I also find that economic *theory* provides only limited guidance about how to create *specific* markets where they have not historically existed and about how to design and implement effective policy measures. There is, after all, a tendency for academic models to rely on theoretical constructs and to thereby oversimplify policy reform challenges (Hahn and Stavins 1992, Friedman 1981). As a result, using theory as our only guide, the relationships between the design of the electricity market and the shape and performance of that market are not entirely obvious *a priori*. Even if one is convinced that encouraging green power is a justifiable objective, economic theory provides only limited guidance on which specific policy approaches would best serve that objective.

5.2.2 Previous Research and Policy Debates

A growing and more topical literature among energy specialists has begun to explore the role and importance of policy in the competitive electricity market in ways that economic theory cannot. Yet, while this literature is beginning to explore policy nuances in more detail, it too has some serious shortcomings. Specifically, it has not focused on issues related to retail market design. Most academic attention has instead concentrated on increasing competition in electricity generation and on *wholesale* market design issues, including market power, market structure, reliability services, and transmission pricing. Stranded assets have also received significant coverage. Although regulators have begun to consider issues related to retail market design, including pricing default utility service, customer education, direct-access phase-ins and processing, unbundling of revenue-cycle services, and customer aggregation, little academic literature exists on these subjects.

With respect to green power specifically, many current debates embrace what I believe is a false dichotomy between “market” and “governmental” approaches to increasing the use of renewable energy, a descendent of “market failures” thinking, discussed earlier. One side claims that, with the development of green markets, strong policy supports will no longer be required; the other emphasizes the fundamental limits to green consumerism and advocates the continuation of traditional policies directed at renewable generators. Although this debate is useful for questioning the role that green marketing might play in supporting renewables in contrast to more directed forms of policy, it has taken attention away from the role of policy in the formation of the green market itself. Where this role has been addressed, emphasis has been on market facilitation efforts that directly shape and promote the green market, including disclosure regulations, green power definitions, and renewables subsidies (Fouquet 1998). With a few exceptions (Nogee et al. 1999), the design of detailed, fundamental competitive market rules has not been emphasized.

5.3 Research Methods

5.3.1 Data Sources and Survey Design

To begin to fill the void in the existing literature and to evaluate the role of policy in the green market, this chapter presents data gathered from one important set of market participants, green marketers. Most of the data come from a mail survey of U.S. green power marketers. Additional information comes from informal interviews with several green marketers, used to probe in more detail specific marketer responses to the survey questions. I also obtained background information on competitive market rules and green power facilitation efforts by reviewing the regulatory filings of power marketers and other stakeholders (renewable generators, policymakers, environmental advocates, etc.). My research method is, to some extent, modeled after that of Karakaya and Stahl (1991), who survey business executives to assess the relative importance of "entry barriers" in a number of industries.

The survey itself was mailed in December 1997, and was designed to elicit information on the relative importance of different types of market barriers, market rules, and market facilitation efforts for the green power market. In order to craft the survey instrument, I created a typology of possible market barriers, rules, and facilitation efforts. To create this typology, I reviewed regulatory filings, academic literature and gray literature, and I pre-interviewed a limited set of marketers. Fifteen potential market barriers and 47 market rules and market facilitation efforts were ultimately identified. The survey itself was mailed to a census of all 15 known U.S. green power marketers operating in competitive electricity markets that had sold, were selling, or had announced plans to sell power products differentiated based on the environmental characteristics of the power supply. Both open- and closed-ended questions were included. To increase response rates and improve the prospects for unbiased responses, I indicated that the responses of individual marketers would not be identified. The survey itself is reproduced here as Appendix B.

Ultimately, 12 of 15 questionnaires were returned. Not all marketers responded to each question, so response rates to individual questions vary. The 12 marketers that responded to the survey can be classified based on a number of different characteristics. In the near term (at the time of survey implementation in late 1997 and early 1998), most have sold or intend to sell green power in California, the Northeast, or both regions. Four marketers are retailers of green power, three are wholesalers, and five are both wholesalers and retailers. Seven of the 12 marketers are affiliated with an electric utility. Four of the marketers claim that they have sold or will only sell green electricity products; eight have or expect to have a product line that includes nongreen products as well.

5.3.2 Research Challenges

As with all research, there are of course limitations to my research methods and design. Perhaps most importantly, because the objective of this research is to explore key electricity market design issues from the point of view of one critical category of stakeholders, a fundamental challenge arises when attempting to draw broad policy implications from the data. After all, most stakeholders are driven by their own narrow interests, and firms frequently use government intervention to handicap their competition (Etzioni 1988). This research therefore does not attempt to make strong recommendations on the “ideal” set of policies needed to develop the green power market. Instead, my goal is to report the interests of green power marketers, draw some implications from the results on the relative value of different forms of policy, and identify areas where the interests of marketers and various other stakeholder groups may not coincide.

Even with these important but restricted objectives, however, three additional research-design challenges, and how I chose to manage them, are highlighted here. Most of these challenges reflect the difficulty in generalizing the results of the survey into an unbiased assessment of what is in the best interest of all green marketers.

First, because electric markets were only beginning to open at the time of the survey, and California and the Northeastern U.S. were moving more rapidly than other regions, the marketers surveyed in this research are limited in number (only 12) and survey responses are likely to be somewhat biased by regional concerns. Despite these drawbacks, I chose to proceed with the research design because of the speed of the restructuring process in the U.S. and worldwide, and the resultant near-term need for information on the role of policy in the formation of the green market. Nonetheless, the results should be viewed with some caution. Because the size of the survey population is small, my goal was not to develop statistically significant descriptive statistics but to discern general trends.

Second, marketers are not a homogenous group; they differ based on the market niche they serve, their organizational structure, and the "greenness" of their product offerings. This makes a general interpretation of the survey results at times difficult. Similarly, though surveys were sent to individuals involved with the green power business, some responses came from individuals who clearly held corporate positions that were not just specific to their green product line; these responses may therefore reflect the corporation's overall goals, not just those related to green power. To clarify differences among respondents, I specifically highlight areas where different perspectives appear to systematically affect the survey results.

Third, the survey population is limited to marketers that have decided to sell green power. I therefore only reached players that had chosen to enter the market as it was structured at the time. I address this limitation at least partially by including marketers that operate in different parts of the country, each of which has its own set of regulatory policies. Nonetheless, because it is impractical to survey companies that might have entered the green market had it been structured differently, I can only acknowledge this limitation.

5.4 Market Barriers to the Development of Green Power Markets

In this and the subsequent section I present detailed research results, principally from marketer surveys and interviews. This section begins by briefly reviewing survey responses that prioritize possible “market barriers.” Using these responses to structure the subsequent discussion, I present survey and interview results in more detail in Section 5.5, describing the marketers’ views on how to best overcome market barriers through the design of competitive market rules and green power facilitation efforts.

In order to determine the relative importance of the 15 market barriers that I identified as potentially thwarting the development of the green power market, each marketer was asked to review the list of 15 barriers and specify the five that they considered to be the “most serious” in terms of their potentially negative impact on the green marketer’s business. Table 5-1 presents the aggregated results of this survey question.

Barriers listed near the top of table were deemed “more serious” by the largest number of marketers; they include the low cost of utility default service, lack of renewable energy supply, onerous direct access processing and service fees, protracted direct access phase-ins, lack of customer education on retail choice, and stranded cost recovery. Less serious barriers include lack of sufficient customer protection regulations and barriers to consumer aggregation.

Table 5-1. Market Barriers to the Development of the Green Power Market: Survey Results

Market Barrier	Number of Times Identified as "Most Serious"
Low cost of utility default service	7
Lack of existing renewable energy plants that are able to sell to marketers due to contract restrictions	7
Direct access processing and service fees that erect barriers for new participants (via high costs, slowness, lack of parity between marketers and utilities, etc.)	6
Protracted direct access phase-ins that favor larger customers	6
Lack of customer education on retail choice	6
Stranded cost recovery	6
Lack of customer education on renewable energy	5
Market power of electric utilities and their affiliates	4
Transmission pricing, ancillary services, and bidding rules that penalize intermittent, low capacity factor, distant renewable generators	3
Insufficient unbundling of revenue-cycle services (metering, billing, etc.)	2
No mandatory fuel source and/or emissions disclosure	2
Power pooling structures that do not allow direct bilateral contracts (but do allow contracts-for-differences and other financial contracts)	2
Insufficient definition(s) of green power	2
Lack of sufficient customer protection regulations	1
Barriers to aggregation of electricity consumers based on geography or affinity	0

* Shaded rows indicate barriers that specifically relate to the green market (and that can therefore be targeted with "facilitation efforts") whereas unshaded barriers are those that impact the competitive market more broadly (and that can therefore be targeted with "market rules").

To structure the following discussion, I separate the 15 market barriers into two categories: (1) barriers that I believe specifically relate to the green market (and that can therefore be targeted with green power facilitation efforts), and (2) barriers that seem to affect the entire competitive electric market (and that can therefore be targeted with competitive market rules). The former are shaded in Table 5-1; the latter are unshaded.

5.5 Rules and Facilitation Efforts to Overcome Market Barriers

Given the existence of market barriers to the development of the green power market, as identified above, what do marketers believe can be done to remove them or at least minimize their impact? By definition, market rules and market facilitation efforts are forms of public policy that can either reduce or enhance these barriers. A key goal of the marketer survey was therefore to map the general market barrier concerns discussed above into specific recommendations on how to structure competitive market rules and green power facilitation efforts.

Section 5.5.1 reports on the survey and interview questions that emphasized competitive market rules and that therefore target the unshaded market barriers listed in Table 5-1. Section 5.5.2 reports on questions that focused on green power facilitation efforts, and that relate to the shaded market barriers. Both sections are structured around the barriers listed in Table 5-1, though Section 5.5.2 also discusses a number of renewable energy and green power policies that do not directly target any of the market barriers but that might affect the green market. For each market barrier and associated rules or facilitation efforts, I supply a brief review of the regulatory issue, report the results from the survey and interviews, and where appropriate provide some interpretation of the results.

5.5.1 Competitive Market Rules

Table 5-2 provides a list of market rules that seem likely to impact all electricity marketers. The rules are divided into groups that relate to the market barriers discussed above. As part of state and federal restructuring proceedings, the design of these detailed rules is being established. Green power marketers in this survey were asked to rate each rule on a 5-point importance scale, where “1” means that the marketer believes that the rule is “valuable” for their business (but far from essential) and “5” means that the marketer believes that the rule is “essential” for their business. Respondents could also indicate opposition to a rule.[45] Table 5-2 shows the frequency distribution of the results. Several open-ended questions were used to probe for details regarding marketers’ attitudes toward specific market rules. I begin my discussion of these results by focusing on the market barriers (and the associated market rules) ranked as “most serious” by the largest number of marketers: default service pricing, customer education, protracted direct access phase-ins, direct access processing, and stranded assets. I then cover barriers and rules regarded by marketers as less important: market power, unbundling, power pooling, customer protection, and customer aggregation.

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[45] Note that the scale used is not a standard 5, 7, or 10-point Likert-type scale for measuring opinion. I chose the 5-point positive importance scale, with the single option for opposition, because I was largely attempting to distinguish among positive ratings of different possible policies—I was not attempting to distinguish among the strength of opposition towards a policy.

Table 5-2. Relative Ranking of Market Rules: Survey Results

Market Rules Affecting all Marketers	My company opposes this rule	My company believes this rule is "valuable" 1	2	3	4	My company believes this rule is "essential" 5
LOW COST OF UTILITY DEFAULT SERVICE						
Establish default utility service rates that provide sufficient margin to encourage entry of competitive suppliers	0	0	0	2	3	5
DIRECT ACCESS PROCESSING AND SERVICE FEES THAT ERECT BARRIERS FOR NEW PARTICIPANTS						
Minimize charges for noncompetitive services imposed by electric utilities on marketers (e.g., costs for customer switching)	0	0	0	0	2	8
Allow use of load profiles for smaller residential and commercial customers	1	1	0	0	2	6
Uniformity and consistency across utility service territories for data transfer protocols, direct access service tariffs and agreements, metering and billing requirements, and other rules	0	0	1	2	4	3
Parity between marketers and utilities with respect to obligations, rights, and charges for billing, metering, data transfer, service agreements, avoided cost credits, customer contracts, etc.	0	1	1	1	1	5
Require utilities to rapidly process direct access service requests	1	1	1	2	1	4
PROTRACTED DIRECT ACCESS PHASE-INS THAT FAVOR LARGER CUSTOMERS						
If a direct access phase-in exists, allow residential customers to receive choice on the same schedule as other customer classes	0	4	0	1	2	3
Full direct access on a date certain without direct access phase-ins	1	1	2	3	1	2
LACK OF CUSTOMER EDUCATION ON RETAIL CHOICE						
Funding for broad-based, nondiscriminatory customer education on retail choice	0	3	1	1	1	4
STRANDED COST RECOVERY						
Establish incentives for stranded cost mitigation by electric utilities	0	1	0	1	5	3
Recover stranded costs via a stable cents/kWh charge, not a charge that depends inversely on the power exchange clearing price	1	2	0	1	3	1
Require stranded costs to be recovered in a short period of time	1	2	0	3	1	2
Less than 100% recovery of stranded costs	4	1	1	0	2	2

Table 5-2. Relative Ranking of Market Rules: Survey Results (continued)

Market Rules Affecting all Marketers	My company opposes this rule	My company believes this rule is "valuable" 1	2	3	4	My company believes this rule is "essential" 5
MARKET POWER OF ELECTRIC UTILITIES AND THEIR AFFILIATES						
Creation of an independent system operator	0	0	1	1	5	3
Utility divestiture of generation assets	1	0	0	2	3	3
Restrictions on utility affiliate marketing in their parent utility service territory and/or their use of the utility name and logo	5	1	0	0	0	4
Regulations that require sharing of customers that choose not to switch suppliers (i.e., creation of multiple default service providers)	3	2	1	1	2	1
INSUFFICIENT UNBUNDLING OF REVENUE-CYCLE SERVICES						
Full and fair unbundling of billing services	0	2	1	2	1	4
Full and fair unbundling of metering services	0	2	2	2	2	1
POWER POOLING STRUCTURES THAT DO NOT ALLOW DIRECT BILATERAL CONTRACTS						
Bilateral trading market structure as opposed to a pooling structure	0	2	0	3	3	3
LACK OF SUFFICIENT CUSTOMER PROTECTION REGULATIONS						
Establish marketer credit requirements during marketer registration process	1	4	2	3	1	0
Establish a code of conduct for all marketers during marketer registration process at PUC	2	1	1	2	3	1
Independent verification of customer orders to switch electric providers	1	5	1	1	2	0
BARRIERS TO AGGREGATION OF ELECTRICITY CONSUMERS						
Removal of barriers to geography and affinity-based aggregation of customers	0	5	1	2	1	1
Allow local governments to act as default service providers without a positive declaration by each customer (customers could opt out)	7	2	1	1	0	0

Low Cost of Utility Default Service. In many states, incumbent electric utilities (now called utility distribution companies, or UDCs) provide "default" generation service to customers that choose not to switch suppliers. If a customer switches suppliers, the generation component of the default service price is subtracted from the overall UDC rate. If billing and metering services are not unbundled, marketers must therefore compete with the default generation price.

Relative to "big ticket" issues such as stranded costs, the default utility service price has received little attention, until recently, in the restructuring literature (Rohrbach 1999, Nogee et al. 1999). However, Table 5-1 shows that marketers regard low default service prices as perhaps the most serious barrier to the development of a robust, competitive market. Given the high costs of acquiring and servicing small customers, marketers can only offer price savings if they can procure electricity at a cost sufficiently below the default price to cover their retail margin (Talbot 1999). Marketers will be hard pressed to compete against a default service provider with a low generation price (Regulatory Assistance Project 1999). As a result, customer switching and marketer competition will be depressed and price premiums for green products can be expected to rise.

Not surprisingly, then, as shown in Table 5-2, all of the green marketers surveyed strongly support establishment of default service prices that provide sufficient margin to encourage entry of competitive suppliers. Interviews with marketers along with a review of regulatory filings also indicate that setting the default price is considered by marketers to be the most important regulatory decision affecting the green market. Responding to an open-ended survey question, marketers say that regulators should establish default generation prices at levels that *exceed* the prevailing wholesale cost of generation, therefore incorporating some of the retailing costs (e.g., administrative costs, overhead, marketing, and profit) that suppliers face when serving the retail market.

Direct Access Processing and Service Fees that Erect Barriers for New Participants. Another critical market barrier identified by marketers is direct access processing and service fees that erect barriers to new market participants. Marketers generally fear that UDCs may have an incentive to impede customer switching. As a result, marketers strongly endorse a number of rules, listed below in order of decreasing importance, to reduce entry barriers and increase customer switching (see Table 5-2). Most marketers believe it essential to:

- Minimize the charges for noncompetitive services imposed by UDCs on marketers, which include direct access processing fees as well as charges for other services that the UDC must provide (customer usage information requests, credit checks, etc.). In California, for example, the UDCs initially proposed direct access service fees of $5-24 per customer, a significant cost in a low-margin business. Partly in response to the concerns of marketers, the California Public Utilities Commission decided not to allow noncompetitive service fees.

- Allow use of load profiling for smaller customers because real time metering is prohibitively expensive for most of those customers. Load profiling allows customers to continue to use existing electric meters. Marketers believe that requiring the purchase of real-time meters would dramatically reduce switching by smaller customers.

- Require uniformity and consistency across utility service territories for data transfer protocols, direct access service tariffs and agreements, metering and billing requirements, and other rules. Many marketers expect to compete in multiple jurisdictions and differences in rules across these jurisdictions can increase product development and marketing costs. Consequently, to the extent possible (where there are no major technical limitations), marketers believe that operational rules should be simple and uniform across service territories and perhaps even state boundaries.

- Establish parity between marketers and utilities with respect to obligations, rights, and charges for billing, metering, data transfer, service agreements, customer information and load data, avoided cost credits, etc. Because the roles and responsibilities of the UDC and the marketer are fundamentally different, full parity is neither desirable nor feasible. Nonetheless, marketers believe that regulators should be particularly wary of market rules proposed by utilities that erect unequal and burdensome requirements on marketers.

- Require utilities to rapidly process direct access service requests to reduce bottlenecks and ensure that customers are switched to new energy service providers as quickly as possible.

Protracted Direct Access Phase-ins that Favor Larger Customers. Some states, such as California, proceeded rapidly toward full direct access; others, such as New York, have phased direct-access in over time. The merits of retail competition pilot programs and phase-ins have been questioned by some industry observers (Landon and Kahn 1996), and the majority of marketers in my survey prefer a rapid transition to competition with certainty regarding the timing and scale of market access.

A large number of marketers identified protracted direct access phase-ins that favor larger customers as one of the "most serious" barriers to the green market. However, marketers' response, though positive, is not as strongly supportive as expected for two policies that address the problems of a lengthy direct-access phase-in (see Table 5-2). The first, a requirement that full direct access be established on a date certain without a phase-in, is not deemed "essential" by most respondents. The second, giving residential customers direct access on the same schedule as larger customers if a phase-in must exist, is also favored but not identified as essential by most marketers. A common theme expressed by many marketers in follow-up interviews was that, because of the low expected profit margin for any individual residential customer, high customer acquisition costs can easily absorb potential profit opportunities. Phase-ins and pilot programs do not generally provide a cost-efficient way to contact customers; mass media outlets are not effective for reaching only the few customers that are eligible to switch suppliers under a phase-in or pilot program. Because the primary source of revenue for green sales is expected to come from residential customers, phase-ins that favor larger commercial customers are viewed by many as particularly objectionable.

Lack of Customer Education on Retail Choice. A fundamental assumption embedded in the competitive-market model is that buyers and sellers have access to adequate and reliable information. In the competitive electricity market, most residential customers are not be accustomed to making electricity supply decisions and may not be aware of the opportunities that restructuring presents. Without effective education efforts, it is often argued, residential customers may be reluctant to exercise their choice of providers (Costello and Graniere 1997). Accordingly, most U.S. states that are proceeding with restructuring have established education campaigns.

Consistent with the literature, as shown in Table 5-1, green marketers believe that lack of customer education regarding retail choice is a key market barrier. Moreover, as shown in Table 5-2, the associated policy response, funding for broad-based, nondiscriminatory customer education on retail choice, is supported by all of the marketers. Not surprisingly, marketers that identified lack of customer education as a "most serious" market barrier tend to give higher ratings to the associated policy response in Table 5-2. Curiously, there appears to be some divergence on the perceived value of these programs, with clusters of marketers on both ends of the 5-point scale. Based on interviews, it appears that this difference in opinion is rooted in different perspectives of the relative value of publicly funded versus marketer funded education efforts. A review of regulatory filings, for example, shows that some marketers are leery of publicly funded campaigns because of concerns that incumbent utilities will have undue influence over the messages disseminated.

Stranded Cost Recovery. Perhaps the most contentious and widely analyzed aspect of the restructuring process has been recovery of stranded costs, the above-market, sunk costs of past utility investments (see, for example, Hirst, Baxter & Hadley 1997). Though full recovery of such costs is occurring in most U.S. states, the conventional wisdom among competitive suppliers as seen in the trade press is that 100% recovery poses a substantial barrier to entry.

The marketer survey uncovered widely divergent and more subtle views on the effect of stranded cost recovery. Six marketers ranked stranded cost recovery as a “most serious” barrier, yet, as shown in Table 5-2, these same marketers (most of whom are unaffiliated with electric utilities) provided only modest support for a rule that would disallow recovery of some portion of these costs. Marketers that are affiliated with utilities generally oppose disallowing recovery of stranded costs. Though it goes against the standard rhetoric of marketers, these responses suggest that the percentage of stranded costs recovered may not be the source of the stranded-cost market barrier or a major hindrance to the development of a competitive market. This proposition is also receiving increasing support in the academic literature (Joskow 1996, Tye and Graves 1996). After all, stranded costs are sunk costs and can be recovered through a nonbypassable charge imposed on all customers, whether or not they switch suppliers. This type of cost recovery should not fundamentally affect the ability of suppliers to offer savings that reflect true economic efficiency advantages: with or without stranded cost charges, competition is primarily restricted to electricity generation and customer services.

In order to better understand the nature of the “problem” from the marketers’ standpoint, an open-ended question in the survey asked marketers how they would design stranded cost recovery mechanisms. Again, few concerns were raised about the overall level of stranded cost recovery. Instead, concern was primarily focused on designing the recovery mechanism to provide sufficient incentives for cost mitigation, to minimize entry barriers, and to not depress the default utility service price. In fact, as shown in Table 5-2, the majority of marketers agree in general on the design of the recovery mechanism: establish incentives for stranded cost mitigation to minimize the overall cost burden, recover costs via a stable cents/kWh charge rather than one that varies based on the market clearing price of electricity, and require these costs to be recovered rapidly.

Market Power of Electric Utilities and Their Affiliates. Market power is the ability of one firm or a set of firms to profitably maintain prices above competitive levels (Costello and Rose 1998). If incumbent electric utilities and their affiliates can exercise market power, they may be able to stifle competition and restrict the entry of other competitive suppliers to the market. Many studies have documented evidence of market power in electricity markets and have modeled the likelihood of market power under different market structures (Wolak, 1998, Rudkevich et al. 1998, Newbery 1995, Borenstein et al. 1995).

Given the breadth and depth of this research on and experience with market power, I expected it to be of concern to green power marketers. I was therefore somewhat surprised that the market-power barrier was not regarded by marketers to be as serious as those barriers discussed earlier. Nonetheless, four of the 12 marketers did rate market power as a “most serious” barrier. More interesting, however, were the results presented in Table 5-2. Specifically, to overcome market power concerns, most green marketers believe two front-end mitigation measures to be extremely important: the creation of an independent system operator (ISO) to control the transmission system and mandatory divestiture of utility generation assets. To a far lesser extent, some also believe that incumbent utility service providers should not be allowed a guaranteed market share by retaining the many customers who decide not to switch providers, but should instead be required to share these customers, via random assignment, auction, or some other process. Another market rule, restricting utility affiliate marketing in parent utility service territories and/or their use of the utility name and logo, received mix results; this type of rule has been offered as a way to prevent utility affiliates from using their market position to create entry barriers. Of the 10 marketers responding to this rule, four were in opposition and five found it "essential." Those in opposition were generally utility affiliates; those in support were not. So, although green power marketers are in general agreement that market power is a threat, they agree on some but not all of the possible market rules to alleviate that threat.

Insufficient Unbundling of Revenue-Cycle Services. Competition in the retail electricity market is possible in two primary arenas: (1) electricity generation and ancillary services, and (2) revenue-cycle services, including billing, metering, collections, payment processing, and customer service. In order to promote competition in the second area, services must be unbundled (Costello 1995). Because full unbundling would compensate marketers for proving revenue-cycle services and expand the range of services for which competition is allowed, it could mediate the impact of a low default utility service price; that is, marketers would have another opportunity to compete against the UDC, and a retail margin would be created. Unbundling would also reinforce the relationship between the customer and the provider of each service.

One might therefore expect that insufficient unbundling of revenue-cycle services would pose a major barrier for marketers. The results presented in Table 5-1 suggest otherwise; only two marketers identify insufficient unbundling as one of the "most serious" market barriers. Nonetheless, as a market rule, full and fair unbundling of billing services is highly ranked by many of the survey respondents, and comments by marketers in regulatory proceedings consistently emphasize the importance of becoming a customer's primary point of contact. Because residential customers in particular are unlikely, in the near-term, to benefit from sophisticated metering services, the unbundling of metering is generally supported but at a modest level. Thus, although unbundling does not appear to be perceived as a critical market barrier or high near-term priority, all marketers support expanding the range of services for which competition is allowed.

Power Pooling Structures that Do Not Allow Direct Bilateral Contracts. A fundamental debate has occurred in many jurisdictions on how to structure bulk power markets (Kahn and Stoft 1995, Hartman and Tabors 1998). Some support a mandatory spot-market pool (Garber et al. 1994); others (including most marketers) champion a "physical" bilateral trading regime, which they claim will increase marketers' flexibility (Levin 1995).

Although many marketers have vocally opposed a pooling-based structure, surprisingly, the green marketer survey suggests that the structure of the bulk power market may be important but is not essential to the development of the green market. As shown in Table 5-2, a bilateral trading structure is preferred by all respondents but was rated "essential" by just three of 11 marketers. In an additional question, six marketers stated a preference for a bilateral structure, six for a hybrid of the bilateral and pool models, and none preferred the pool-based model. Responses to an open-ended question reveal that support for the bilateral or hybrid models is based on a perception that these structures offer the greatest flexibility to marketers, and that pools will evolve naturally when and where needed. Yet just two of the green marketers surveyed felt that a pooling structure that did not allow “physical” bilateral contracts would be a “most serious” barrier to their business.

Lack of Sufficient Customer Protection Regulations. Consumer advocates often point to other restructured industries to illustrate the regulatory vigilance required to protect customers (Stutz et al. 1996). Consequently, electricity regulators have established customer protection regulations ranging from marketer registration, to licensing requirements, advertising guidelines, credit requirements, and customer disclosure, privacy, and disconnection obligations (Alexander 1998).

Despite concerns by consumer advocates, lack of customer protection regulations is considered a serious barrier by just one green marketer (see Table 5-1). Table 5-2 lists three rules that regulators could implement to enhance customer protection: marketer credit requirements, mandatory codes of conduct, and independent verification of customer orders to switch suppliers. Marketer reaction to these rules is lukewarm at best. Based on interviews with marketers and a review of regulatory filings, it appears that, while the need for minimum customer protection regulations is acknowledged, marketers are concerned that poorly designed regulations could add significantly to the cost of doing business, inhibit the development of new products and services, and reduce customer switching. Interviews also revealed a desire to limit customer protection regulations to circumstances where the possibility of marketer abuse is likely to be highest, and to carefully balance tradeoffs between more stringent regulations and the establishment of barriers to market entry.

Barriers to Aggregation of Electricity Consumers Based on Geography or Affinity. Certain types of customer aggregation have the potential to increase the benefits of restructuring for smaller consumers (Stutz et al. 1996).[46] Proponents of aggregation, especially when it is done by a local government, also contend that electricity supply choices made by a group of citizens *collectively* are more likely to reflect social and public concerns and therefore to include renewable energy, than decisions made by *individual* consumers (Asmus 1997). One way to encourage consumer aggregation is to allow local governments to aggregate residents on an "opt-out" basis (Ridley 1997); for example, Massachusetts law allows aggregation by local governments, in effect giving governments default provider status.

Interestingly, no marketer identified barriers to aggregation as a "most serious" market barrier. Moreover, as shown in Table 5-2, the removal of barriers to aggregation received limited support. Finally, a market rule that would allow local governments to aggregate citizens on an "opt-out" basis was opposed by seven of the 11 marketers. In some respects, these negative results are not particularly surprising. In marketer interviews, for example, I learned that local-government aggregation, especially on an

[46] Aggregation can reduce the cost of attracting customers, increase the buying power of the aggregated group, and decrease the search costs and information barriers that a customer faces when selecting among offers.

opt-out basis, is frequently viewed as a potent competitor to existing *retail* green power marketers, which are required to attract customers individually.

5.5.2 Green Power Market Facilitation Efforts

Unlike competitive market rules, which affect all retail suppliers of electricity, green power facilitation efforts are intended to directly encourage the customer-driven market for green power and/or to broadly promote the market for renewable energy. Market facilitation efforts target the shaded "market barriers" identified in Table 5-1. Table 5-3 provides a list of prominently discussed green power facilitation efforts, divided into groups that relate to the market barriers in Table 5-1.[47] Green marketers in my survey were asked to rate these facilitation efforts on a five-point importance scale, with the option of stating opposition to each effort. Table 5-3 shows the frequency distribution of the results. As before, I asked a number of additional questions to gather details regarding specific policies.[48] In discussing the results, I focus first on market barriers (and associated facilitation efforts) that were viewed as "most serious" by marketers.

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[47] For the purposes of this survey, I chose not to include indirect forms of facilitation efforts such as air emissions regulations, carbon taxes, etc.

[48] One general finding from the table is that most facilitation efforts are opposed by at least one or two green marketers. Because the marketers are not a homogenous group, the same facilitation efforts are unlikely to be equally important to each marketer. Nonetheless, it is somewhat puzzling that facilitation efforts that would clearly positively impact the green power business are opposed. In some cases, it appears that the marketers are providing broader corporate positions rather than positions specific to their green product line.

Table 5-3. Relative Ranking of Market Facilitation Efforts: Survey Results

Market Facilitation Efforts that Differentially Affect Green Power Marketers	**My company opposes this effort**	**My company believes this effort is "valuable" 1**	**2**	**3**	**4**	**My company believes this effort is "essential" 5**
LACK OF EXISTING RENEWABLE ENERGY PLANTS THAT ARE ABLE TO SELL TO MARKETERS						
Renewable energy project siting and permitting procedures that allow for more rapid construction of renewable projects	2	2	2	2	1	3
Incentives for the restructuring and buy-out of existing renewable energy qualifying facility (QF) contracts	1	3	4	1	1	2
LACK OF CUSTOMER EDUCATION ON RENEWABLE ENERGY						
Publicly-funded education on renewable energy and green power products	1	4	1	0	4	2
TRANSMISSION PRICING, ANCILLARY SERVICES, AND BIDDING RULES THAT PENALIZE RENEWABLE GENERATORS						
Fair payment to generators that provide T&D support benefits (e.g., local PV)	0	3	2	2	5	0
ISO/bidding rules that do not penalize intermittent generators and small generators	3	1	1	3	3	1
Ancillary service costs that do not penalize intermittent, low capacity factor generators	3	1	1	4	1	2
Transmission pricing rules that do not penalize intermittent, low capacity factor generators	3	1	1	4	2	1
Transmission pricing rules that do not penalize generators located far from load	3	2	2	2	1	1
Creation of a renewables-only power pool	3	3	1	3	1	1
NO MANDATORY FUEL SOURCE AND/OR EMISSIONS DISCLOSURE						
Mandatory disclosure of fuel mix, emissions, and/or pricing and contract terms information	1	1	3	3	1	2
INSUFFICIENT DEFINITION(S) OF GREEN POWER						
Third-party certification of green power products	0	2	2	1	3	4
Product or company endorsements by environmental groups	0	2	1	3	3	3
State-level (PUC or legislative) definition of "green" power	3	2	2	2	2	1
Expansion of FTC green marketing guidelines to green power marketing	2	2	4	2	2	0

Table 5-3. Relative Ranking of Market Facilitation Efforts: Survey Results (continued)

Market Facilitation Efforts that Differentially Affect Green Power Marketers	My company opposes this effort	My company believes this effort is "valuable" 1	2	3	4	My company believes this effort is "essential" 5
OTHER GREEN POWER MARKETING FACILITATION EFFORTS						
Monetary production incentives or rebates to customers that purchase green power	1	1	1	0	7	2
If a direct access phase-in exists, allow immediate access for all customers that are willing to purchase a certain percentage of renewable energy	2	0	0	1	5	3
Government purchases of green power	2	1	1	2	6	0
Tax or financial production incentives and/or low interest loans to renewable energy generators	1	2	1	2	2	3
Net metering of customer-sited renewable energy facilities	1	3	1	3	2	1
Allow customers to make renewables contributions or purchases through their default service provider	5	3	0	1	2	1
Establishment of state or federal renewables portfolio standards	6	1	0	2	0	2

Lack of Existing Renewable Energy Plants that are Able to Sell to Marketers. Existing renewable facilities are frequently able to sell electricity to marketers at lower cost and with more favorable terms than are new renewable plants. Consequently, in the near term at least, most green power marketers expect to use a large amount of existing generation in their product offers. In some regions, however, renewable generation is limited; even where supply is available, much of it is tied up in long-term contracts with utilities.

Table 5-1 shows that a lack of existing renewable plants that can sell to marketers is viewed as a critical market barrier; six of 12 respondents designate it as "most serious." Detailed results from the marketer survey, however, suggest that this barrier may not have a clear-cut regulatory remedy. One possibility would be to provide incentives for the restructuring and buy-out of existing nonutility renewable contracts – the current contract restructuring process is complex and time consuming. As shown in Table 5-3, this approach is looked upon somewhat favorably by most of the marketers. Not surprisingly, marketers strongly affiliated with a utility (and therefore perhaps skeptical of the contract buy-out process) generally ranked this green power facilitation effort rather low whereas nonaffiliated marketers ranked it higher. Another regulatory approach would be to speed up the process of siting and permitting new renewable facilities, thereby allowing new projects to come on-line more rapidly than is traditionally the case. This approach is also supported by the bulk of the marketers. Neither of these regulatory strategies is given the highest priority by most marketers, however. In addition, many of the marketers that rated lack of renewable supply to be a "most serious" market barrier did not rank either of these green power market facilitation efforts highly. I therefore infer that marketers may not see either facilitation effort as a clear remedy to the market barrier. In interviews, marketers noted that even with incentives for contract buy-outs and a more rapid permit and siting process, there is still likely to be a time lag between the opening of the market and the availability of generation.

Lack of Customer Education on Renewable Energy. Although they have met with varying levels of success, publicly funded education campaigns, from recycling programs to "say no to drugs" campaigns, have been and are often undertaken (Weiss and Tschirhart 1994). In addition to offering general education on retail choice, policymakers should also fund educational efforts specifically targeted at green power according to some renewable-energy advocates. After all, market research sometimes finds that individuals are poorly informed about the source of their electricity supply, are concerned about the reliability of renewables, and may not directly link their electricity use to environmental harm (Moskovitz et al. 1998). Some states, such as California, have already established renewable energy education programs.

The market barrier results shown in Table 5-1, as well as the results presented in Tables 5-2 and 5-3, show that marketers generally believe that broader educational efforts on retail choice should be the first priority but that programs targeted specifically at renewable energy could also be an effective use of public funds. Five marketers view lack of customer education on renewable energy as one of the "most serious" market barriers. Interestingly, though most marketers support publicly funded education campaigns on renewable energy (see Table 5-3), as with broader campaigns on retail choice, there is a divergence in the perceived importance of these efforts; there are clusters of marketers on both ends of the five-point scale. This result may reflect a difference of opinion among marketers on the relative value of publicly funded versus marketer-funded campaigns (a similar debate exists in the academic literature – see Weiss and Tschirhart (1994) – on the effectiveness of publicly funded information campaigns). The five marketers that ranked lack of customer education as a "most serious" barrier also ranked the associated green power facilitation effort highly.

Transmission Pricing, Ancillary Services, and Bidding Rules that Penalize Renewable Generators. The pricing of transmission service, the provision of ancillary services, and the rules and procedures for ISO/bidding are each the subject of significant, ongoing research. However, concerns have been raised that these operational rules could (unintentionally or deliberately) penalize some forms of renewable energy relative to more traditional generation sources (Stoft et al. 1997, Ellison et al. 1998).[49]

The literature suggests that the combined impact of these operational "penalties" may be to dramatically increase the effective cost of renewable energy (Ellison et al 1998). As a result, I expected that the design of these operational details would be of paramount importance to green marketers. Surprisingly, the survey results did not fulfill this expectation. Transmission pricing, ancillary services, and bidding rules that penalize renewable generators was deemed a "most critical" barrier by just three marketers. Moreover, as shown in Table 5-3, three marketers consistently opposed facilitation efforts that would alleviate operational penalties. These respondents appear to reflect corporate interests that go beyond the sale of green power, however, and each of these companies is strongly affiliated with larger utility parents for whom green power sales are only a small portion of business. Though the remaining nine marketers were generally supportive of policies to alleviate operational penalties, the degree of support varied widely, and few viewed such facilitation efforts as essential. Overall, these efforts are apparently viewed as somewhat less important than I expected based on a literature review.

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[49] For example, firm transmission service has historically been sold on a take-or-pay basis, meaning that generators must reserve transmission capacity in advance and pay for what is reserved regardless of how much electricity is actually transmitted. Thus, because of the intermittent nature of solar and wind power, these generators typically pay for transmission that is never used. Similar issues exist in the pricing of ancillary services. Moreover, because renewables are often located some distance from load centers, renewable generators often incur additional distance-based transmission costs. Distributed generation facilities, which can provide transmission and distribution (T&D) support benefits, are frequently not remunerated for these services. Finally, if ISO/bidding and dispatch rules penalize generators for not being able to precisely estimate future deliveries, intermittent generators will be further disadvantaged.

No Mandatory Fuel Source and/or Emissions Disclosure. Academic literature shows that private firms do not always have incentive to provide accurate, reliable, and easily comparable information on product offers (Akerlof 1970, Beales et al. 1981). Indeed, in the rush of businesses engaging in environmental marketing during in the late 1980s and early 1990s, concerns increased regarding the truthfulness of green claims. These issues have recently spilled over to the green power arena where many environmental claims have been criticized as misleading and/or fraudulent (Rader 1998). In part because of these concerns, governments have taken an increasingly active role in imposing disclosure and labeling requirements to enhance the quantity and quality of consumer information. For green power, mandatory disclosure and labeling of fuel mix, air emissions, and pricing is frequently argued to be vital for customer protection. Disclosure will not only benefit customers, according to its proponents, but will also help legitimate suppliers validate claims about the sources of their energy supply (Holt 1997, Moskovitz et al. 1997). Responding to these arguments, a number of states have already implemented disclosure regulations for electricity marketing.

Despite these arguments, survey and interview responses from marketers show a positive but somewhat mixed reaction to disclosure requirements. Table 5-3 shows that mandatory disclosure of fuel source, emissions, and pricing is viewed positively by all but one of the green marketers. When asked separately whether some form of mandatory disclosure is critical for fostering informed customer choice, 11 out of 12 answered affirmatively and, when rating the importance of different forms of disclosure on a five-point scale, marketers chose fuel source disclosure as most important (average rating =

4.3), followed by pricing and contract terms (3.5) and air emissions (3.2). Although these results suggest that marketers are generally supportive of mandatory disclosure regulations, such regulations are clearly not perceived to be essential. A lack of fuel source and/or emissions disclosure was identified as a "most serious" market barrier by only two out of 12 marketers, and as shown in Table 5-3, marketers are evenly distributed in their positive rating of disclosure across the 5-point scale. The possible genesis of this positive but not overly enthusiastic reaction is discussed in Section 5.6.

Insufficient Definition(s) of Green Power. Though there is no single, unambiguous definition of "green" power, policymakers may want to define this term to protect customers from false and/or misleading advertising by marketers. Experience shows that some marketers make misleading claims about their products in order to attract customers. The Federal Trade Commission's (FTC) green marketing guidelines, past actions by attorneys general to thwart "green washing," and a wide variety of government-run certification programs all suggest growing recognition that the government should play a role in defining green marketing terms.

One approach to defining green power would be for the FTC to expand their green marketing guidelines to apply directly to green power marketing terms. Another approach, which is already being taken in some U.S. states, would have state PUCs, legislatures, and/or attorneys general define green power. Though such definitions may play an important role in customer protection, only two of the green marketers believe that lack of green power definitions are a "most serious" market barrier. Moreover, though looked upon favorably by most, neither of the two facilitation efforts discussed above ranks particularly high relative to other policies; a number of marketers oppose or give low positive rankings to these efforts. Although the two approaches are not mutually exclusive, marketers appear to more strongly support a voluntary (rather than regulatory) approach to defining green power; endorsements by environmental groups and third-party certifications of green power products are both viewed very positively by the marketers. The value of certification and endorsements has been actively debated (Abt Associates 1994, Taylor 1958, Parkinson 1975, Laric and Sarel 1981, Phelps 1949). Nonetheless, past research has found that certification efforts, if designed well, can help influence product purchases, reduce customer search costs, and spur suppliers to compete in offering environmentally preferable products (Abt Associates 1993). Based on the apparent value of these efforts to green marketers (and customers), a number of environmental groups already endorse particular products, and a green power certification effort has been launched in the U.S. (Rabago et al. 1998).

Other Market Facilitation Efforts. In addition to the green power facilitation efforts described above, which specifically target the market barriers discussed earlier, a number of other policies are under review by states that want to promote the green market specifically and/or the renewable energy industry more broadly. Some of the most important programs are listed in Table 5-3.

Table 5-3 shows that the perceived value of these efforts varies among marketers. The majority of green marketers strongly favor two policies: (1) if a direct access phase-in exists, allow immediate access for all customers that are willing to purchase a certain percentage of renewable energy; and (2) offer monetary production incentives or rebates to customers that purchase green power. These two efforts are generally rated as more valuable than any of the other facilitation efforts listed. Other programs that are widely but less strongly supported include government purchases of green power, tax or financial production incentives and/or low-interest loans to renewable energy generators, and net metering of customer-sited facilities.

Two facilitation efforts are opposed by a number of the marketers. First, five of the 12 marketers object to giving customers the opportunity to make renewable contributions or purchases through their default utility service provider. Though such a policy would offer the many utility customers that choose not to switch suppliers the opportunity to support renewable energy, marketer interviews revealed a concern that this policy would create a disincentive for customers to switch suppliers and could therefore reduce competition. As a result, this policy is viewed as a competitive threat by a number of the green marketers. Second, although several of the marketers support the renewables portfolio standard (RPS), which would require all electricity suppliers to purchase a fraction of their power from renewables, six of the 11 respondents oppose this policy. The RPS, it is argued by marketers, would restrict the availability of low-cost renewables (which might all be absorbed by the RPS) and could make it more difficult to differentiate and sell a green product that exceeds the minimum requirements imposed by the RPS (because all electric suppliers could claim to meet the minimum renewables requirement).

5.6 Key Research Findings

Based on the detailed results described in the previous section, it appears as if green marketers are particularly concerned that policymakers will provide incumbent utilities "undue" competitive advantages, therefore restricting the entry of and market opportunities for alternative suppliers. They also worry that regulators will make seemingly benign policy-design decisions that will, unwittingly or not, stifle development of the green market. These and other fundamental concerns are reflected in the four general research findings highlighted below.

1. Marketers Believe that Profitable Green Power Markets will Only Develop if a Solid Foundation of Supportive Market Rules and Facilitation Efforts Exists: In undertaking this research, I presumed that public policy decisions would play a role in shaping the green power market. Given the nature of the replies to the survey, I conclude that green power marketers strongly agree with this premise. The large number of "essential" ratings in the marketer survey, for example, show that green marketers believe that their markets will require supportive public policies and that the existence of green marketing opportunities does not eliminate the need for policy. Marketer interviews and a review of regulatory filings bolster this contention. Moreover, although marketers hold strong convictions about which forms of policy would be most valuable (see below), they do not uniformly express a preference for a single, "optimal" approach to encouraging the green market. Instead, the survey results show that a wide variety of competitive market rules and green power facilitation efforts are believed to be important. I also observe that many marketer concerns focus not on the choice of policy mechanism but on the specific details of the mechanism. For example, marketers' fear regarding stranded costs focuses on the design of the recovery mechanism rather than the magnitude of the cost recovery.

2. <u>Marketers Consider Establishing Price Competition and Encouraging Customer Switching as First Priorities</u>: I find that marketers' single most pressing concern is that the competitive market rules be designed in ways that encourage overall price competition among suppliers, thereby promoting customer switching. Establishing specific green power facilitation efforts is a secondary concern. Evidence for this finding can be found in regulatory filings, interview results, and responses to the marketer survey. Of the market barriers rated as "most important" by marketers, for example, five of the top six broadly affect the competitive market and are therefore targeted with market rules (see Table 5-1). (Those barriers that might be targeted with facilitation efforts generally ranked as less important.) As discussed in detail earlier, setting the level of the utility default service price, which has the most direct effect on the viability of price competition, is regarded by marketers as the single most important regulatory decision. Marketer responses to other market rules, including those focusing on customer education, direct access processing and phase-ins, stranded costs, customer protection, and unbundling, also relate to encouraging price competition and customer switching. In interviews, marketers seemed particularly concerned that customer inertia and advantages held by incumbent utilities may mean that years will pass before the majority of residential consumers switch from their local utilities. An ability to offer savings to customers that switch is viewed as the best way to break down this barrier; marketers believe that their success in selling green products relates most directly to the amount of competition and customer switching in the market as a whole (Counihan 1999). In this sense, concerns of green marketers appear rather similar to those of all marketers (Electric Power Supply Association 1999).

3. Marketers are Somewhat Leery of Government-Sponsored or Mandated Public Information Programs: Some market rules may directly increase the level of "green" sales whereas other ("information based") regulations are intended to enhance the veracity of green claims and the environmental value of green offerings. Marketers strongly support rules that increase green sales. My research has, however, uncovered some difference of opinion over the second class of policies. On one hand, as evidenced by their generally positive response to disclosure, certification, and environmental endorsements, marketers recognize that some information requirements are needed, perhaps reflecting Porter's (1980) premise that suppliers have an interest in ensuring that substandard marketing practices do not poison the entire market. On the other hand, mandatory disclosure is not uniformly hailed as an essential policy, and governmental definitions of green power are not viewed with great enthusiasm. Based on marketer interviews and a review of regulatory filings, this wariness appears to come from two sources. First, experience shows that some marketers find it worthwhile to offer inferior products and make misleading environmental claims to maximize short-term profits; these marketers may be concerned that information regulations would restrict these practices. Second, marketers appear to be deeply concerned about the down side of poorly designed and implemented information programs, which could restrict the size of the market by making green products prohibitively expensive. For example, the most critical element of disclosure, from the marketers' perspective, does not seem to be whether or not it is required but rather whether the disclosure system is designed to be practical, reasonably inexpensive, and free of administrative burdens that might unintentionally interfere with green market operations (Renewable Energy Alliance 1998).[50]

4. <u>Marketers Often Oppose Three Specific Renewable Energy Policies that May Have Negative Impacts on their Profitability:</u> Public policies can facilitate, augment, or replace certain types of private exchange (Harris and Carman 1984). The majority of policies considered in this chapter facilitate voluntary transactions between green marketers and customers. Some policies covered, however, support renewable generation more directly and therefore only affect the existing green market in a secondary fashion. Although marketer response to policies that facilitate marketer-customer transactions is often resoundingly positive, survey responses show a more negative reaction to some policies that do not specifically target the development of green markets. Evidence presented earlier shows that most of the marketers support certain policies directed at renewable generators, such as tax incentives, financial support, and net metering. At least three policies, however, are opposed by a number of marketers: (1) allowing local

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[50] Another example comes from the response to green power definitions; private and nonprofit efforts were favored over governmental ones. The primary reason stated by the marketer's for their unenthusiastic reaction to governmental definitions is the potential down side if the definitions "overly restrict" the types of resources and products that can be classified as green, thereby limiting innovation in product design and reducing the availability of green resources. For example, if green definitions proceed on a state-by-state basis, regional disparities could force marketers to design and market products state by state rather than using a regional strategy.

governments to act as default service providers (7 of 12 marketers oppose this policy), (2) enabling customers to make renewable contributions through their default providers (5 of 12 oppose), and (3) creating renewables portfolio standards (6 of 11 oppose). Why are some policies that support renewable generation perceived as valuable by the vast majority of marketers while others are not? Marketer interviews suggest that the root cause is a fear about the inadvertent but potentially negative impacts of certain renewable policies on the size of the green market and on the marketers' profitability. While many forms of renewable energy policy are believed to be consistent with and indirectly supportive of the green market, in these three instances marketers fear that the enactment of the policy may reduce customer demand for their green power products. Marketers therefore believe that policymakers need to carefully weigh the intended benefits of these policies with their possibly negative consequences. In general, and not surprisingly, marketers are more strongly supportive of policies that are compatible with the *existing* set of market institutions and that facilitate transactions between willing buyers and sellers of green power.

5.7 Implications, Tensions, and Unanswered Questions

What implications can be drawn from these findings for those interested in supporting the green market in order to capture the environmental benefits of renewables? I have thus far avoided drawing these broad normative conclusions. After all, this research prioritizes policy instruments from the perspective of just one stakeholder group. Policymakers, though, must make complex tradeoffs among numerous stakeholder interests and social objectives. Therefore, I do not attempt to identify an "ideal" suite of rules and facilitation efforts here. Nonetheless, I do believe that marketers' views can shed light onto how best to foster renewable energy via the green market and how best to target incremental research activities. This research has also helped uncover several tensions among marketers' interests and the presumed interests of other stakeholders (as expressed in regulatory filings and advocacy efforts). An understanding of the disparity of interests can help advocates and policymakers as they consider programs to support renewable energy and the green market.

First I highlight three broad implications of this work for policy and research. Although they are not proven, these implications appear relatively uncontroversial:

- First, responses of marketers suggest that the design of market rules and facilitation efforts will not only affect but will play an absolutely critical role in shaping the size of the green market and the environmental quality of the products it offers. Thus, for those interested in seeing the green market stimulate development of renewables, and for those interested in researching green markets more generally, significant consideration will need to be given to both traditional and new forms of policy. There seems to be no escaping the role of policy in the development of renewable markets. Importantly, this implication runs counter to many modern debates (described in Section 5.2.2) that separate "policy" and "market" approaches to commercializing renewables and that de-emphasize the importance of policy for the green market itself.

- Second, it does not appear that there is a single, “optimal” approach to encouraging the green market; neither marketers nor other stakeholders have identified such a strategy. Moreover, many concerns expressed by marketers emphasize detailed implementation issues that arise during restructuring proceedings, not broader policy considerations. Just as all markets are exceedingly varied and complex, apparently so are the instruments that might be used to frame or modify those markets. A heightened awareness of the impacts of seemingly innocuous market design decisions therefore seems called for, and a wide array of rules and facilitation efforts may need to be considered by policymakers and green power advocates alike.

- Third, perhaps the most important implication of this study is its suggestion that green power proponents and researchers may want to place additional emphasis on laying the basic foundation for retail (rather than wholesale) competition. The emphasis on retail market design differs from what has been emphasized in academic discussions of restructuring: wholesale market design and stranded costs. It also differs from the emphasis thus far in discussions of green power: green power facilitation efforts, but not competitive market rules. My findings indicate that policymakers and advocates should consider expanding their renewables-policy toolkit to include the detailed market rules that affect retail competition. Rules that encourage overall price competition and customer switching, particularly default utility service prices, appear to deserve special attention. Such rules directly address marketers’ fears about the advantages held by incumbent utilities and the barriers to entering the market.

These new insights into the green power market are likely to be uncontroversial. But, if policymakers follow the marketers' guidance on the design of specific policies, will renewable energy use increase and will this increase come without sacrificing the interests of other important stakeholders (e.g., consumers, utilities, environmental advocates)?

As noted earlier, many of the marketers' detailed preferences are based on two fundamental concerns: (1) the impact of advantages held by incumbent utilities on retail competition and customer switching, and (2) the negative, unintentional effects of seemingly benign market design decisions. These fundamental concerns are likely to be shared by the majority of stakeholders interested in electric industry reform. Thus, in many instances the detailed preferences of marketers are likely to serve the interests of other stakeholders and thus form a strong basis for policy decisions. For example, setting the default generation price to reflect a retail margin, educating customers about choice, reducing direct assess barriers, ameliorating market power, and unbundling are all rules that most stakeholders (with the possible exception of utilities) would agree with on principle. In fact, as argued by Michelman (1998), the design of these rules is fundamental to the development of overall retail competition. Many of these rules also appear consistent with the goal of stimulating renewable energy development. For example, marketers believe that rules that stimulate price competition and encourage overall switching will maximize the number of green power customers. Wiser et al. (1999) show that this contention is strongly supported by empirical evidence in four U.S.

states, where variation in the number of switches to green power is linked to default utility generation prices (and therefore to overall switching activity). Accordingly, if policymakers respond to green marketers' concerns regarding these market rules, it seems likely that green product sales will increase.

In undertaking the research for this study, however, I have identified three key questions that address areas where marketers' preferences may not increase renewable energy development and/or serve the needs of all stakeholders. In these instances, the appropriate policy response is uncertain. Because the focus of this study has primarily been on marketers and because green markets continue to evolve, full answers to these questions are not yet available. Nonetheless, these questions are at the heart of most current debates related to green markets and highlight important tensions between the interests of marketers and those presumed to be held by other stakeholders.

1. ***To what extent should price competition and customer switching be encouraged at the expense of cost shifting?*** At a certain point, marketers' preferences for increased price competition and customer switching begin to diverge from the interests of other stakeholder groups. Marketers clearly have an interest in promoting rules that provide not just parity with incumbent utilities but competitive advantage. Take the example of the default utility generation price, the most important rule identified by marketers. Though there is increasing agreement among a wide variety of interest groups that the default price should incorporate some form of retail margin (Knight 1998, Nogee et al. 1999), there is little consensus on the appropriate magnitude of that margin (Kahn 1998). A high retail margin is typically supported by marketers because it promotes

price competition, breaks down customer inertia, and encourages near-term competitive entry. Yet, a high margin is generally opposed by utilities and their remaining customers because it entails cost shifting and would reduce the utility's customer base. I have not yet heard a persuasive case for any particular standard of "fair" or even "efficient" competition in these situations. More research is therefore required in this area and policymakers must delicately balance a desire to enhance retail price competition (and in so doing increase green power sales) with a need to minimize cost shifting.

2. ***What requirements should be imposed to ensure credibility in green products and marketing?*** Marketers' preferences for certain information regulations may also diverge from those of society. Marketers have a strong desire to expand green power sales. Presumably, though, the broader social interest associated with the green market is in increasing renewable energy supply and thereby creating net environmental improvements. Increased green sales will only deliver on this promise if green products are truly green and contain incremental renewables supply. Marketers, however, remain leery of information requirements, especially state- or FTC-derived green power definitions. This wariness may be justified from a societal standpoint when the information requirements are so restrictive that they "unduly" limit green power sales and therefore renewable energy supply. On the other hand, too much leniency may allow marketers to maximize sales of substandard products that do little to increase renewable energy supply, a serious concern of most environmental and consumer groups (Wiser et al. 1999). Unfortunately, as noted by

Beales, Craswell & Salop (1981), satisfactory principles for determining when and how government ought to respond to consumer information problems have not yet been developed. Consequently, while this study illustrates the need to consider the impact of information requirements on product innovation, product design, and green power sales, the appropriate scope of information regulations remains unclear.

3. ***How should the green power market relate to broader renewable policies?*** A final question facing policymakers is how best to target policy efforts: toward fostering a customer-driven green market or toward renewable generators themselves. Marketers generally support policy tools that foster the green power market directly. Understandably, they are particularly concerned about renewable policies that they believe might negatively impact their profitability. Interviews with other stakeholders make clear, however, that many renewable energy, consumer, and environmental representatives doubt whether the green market can successfully support significant quantities of incremental renewable energy (Rader and Short 1998, Energy Center of Wisconsin 1997). A focus on policies to foster the green market, they claim, may be inefficient and may divert attention from more important policies targeted directly at renewable generators. It seems evident therefore that, wherever possible, renewable policies should be designed to at least not limit marketers' opportunities to offer high-quality green power products. At the same time, enthusiasm for green marketing may need to be attenuated by a realistic understanding of its limits, and policy choices will not always be reducible to making existing green markets work better. The interaction between green marketing and general renewable policies clearly remains a fertile area

for further research and policy consideration.

5.8 Concluding Thoughts

It is too early to empirically estimate the likely size of the green market, or to predict with precision the ability of that market to deliver environmental benefits (Wiser et al. 1999). As others have shown, consumer markets for green power cannot be expected to *fully* satisfy broader environmental objectives (Rader and Norgaard 1996). Nonetheless, experience in both regulated and deregulated contexts provides empirical evidence that a niche market for “green power” may exist among electric customers.

This study challenges the position, sometimes asserted in debates on green consumerism, that profitable, sizable, credible markets for green power products will evolve naturally without supportive public policies. I have shown that marketers of green power identify as vital a range of competitive market rules and green power market facilitation efforts. Many green marketer preferences are consistent with those presumed to be held by other stakeholders as well. I therefore conclude that even voluntary green product markets are likely to require a foundation of supportive policies.

Though the regulatory and legislative “rules of the game” are vitally important in orchestrating the scope and nature of competition, Williamson (1998) notes that only rarely do windows of opportunity open in which broad reform of these rules is possible. It is apparent that restructuring provides one of those windows in which broad reform is possible. If policymakers are to design the rules-of-the-game in ways that enable and encourage the increased use of renewable energy via green power markets, there is not likely to be a better time than the present.

Academic theory offers some insight into how to select and design policy instruments for the green market, but there are limits to the use of existing theory for policy prescription. In this study, I have primarily used direct surveys and interviews of marketers to uncover policy and research insights. From the marketer's perspective, I have documented significant differences in the relative importance of policy instruments and have identified specific policy details that could impede the development of the green market. It is hoped that my findings will add to an understanding of policy-market interactions and contribute to the development of sound policy toward green markets.

Designing the rules that will govern the electricity market is a complex task, however, requiring tradeoffs among competing and sometimes conflicting goals. Much remains to be done to develop systematic methods for selecting policies. I have therefore identified areas where the interests of marketers and those of society might diverge, posing three questions to direct future research. Beyond cautioning that the devil truly is in the details, I hope that the work presented in the preceding pages provides a framework for policymakers to begin targeting their efforts and offers a fertile starting point for subsequent research efforts.

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Chapter 6

Payment Preferences and Free-Riding: Using Contingent Valuation to Explore Willingness to Pay for Renewable Energy

ABSTRACT

There are a variety of ways to support environmental public goods, including renewable energy. This chapter uses contingent valuation (CV) to explore the sensitivity of stated willingness to pay for renewable energy to different payment and provision contexts. The two payment methods considered are collective and voluntary increases in electricity bills, while the two provision arrangements are government and private collection and expenditure of funds. The resulting four CV scenarios are valued at three bid points (i.e., payment levels) using a single-bounded, dichotomous choice contingent valuation survey of 1,574 U.S. households. I find that reported willingness to pay (WTP) is somewhat sensitive to the payment method and provision arrangement. Higher WTP is elicited under collective payment than under voluntary payment, suggesting that collective payment measures are preferred to voluntary ones. There seems to be some recognition by survey respondents that collective, policy-based approaches to supporting renewable energy will be more effective than voluntary green power marketing efforts, perhaps due to concerns for free-riding in the voluntary case. In addition, private provision elicits a higher WTP than does government provision, suggesting a relatively lower faith in the government as an effective direct provider of public goods. As such,

programs to support renewable energy that involve the private sector (such as the renewables portfolio standard) are more highly favored than those that involve higher levels of government administration (such as the system-benefits charge). Another interesting result is that those survey respondents who indicate a willingness to pay for renewable energy are also far more likely to believe that many other American households will also contribute. This finding and other confirmatory evidence provide tentative support for a "bandwagon" or "reciprocity" effect in CV responses, though additional research will be needed to confirm and understand this result. Each of these results is found to be consistent with those of a companion opinion survey of 202 households. Overall, my findings have implications for the methodology and practice of contingent valuation, for understanding the relationship between stated WTP and one's expectations for the participation of others, and for policymakers and marketers interested in supporting renewable energy.

6.1 Introduction

Some of the most basic questions about the organization and functioning of society involve issues raised by the existence of public goods. With respect to environmental public goods, how should funds used to support environmental improvement be collected and used? In particular, are collective, mandatory payments superior to voluntary, charitable payments due to the possibility of free riding? And to what degree should the government be involved in spending these funds: should the government directly fund environmental improvement projects or should the private sector be used to collect funds and determine funding priorities?

This chapter explores the payment preferences of U.S. households through the implementation of a contingent valuation (CV) survey of willingness to pay (WTP) for renewable energy. Renewable energy can be supported through a mandatory tax on electric bills or through voluntary payments via green power marketing; the government may or may not be heavily involved in the collection and expenditure of such funds. Renewable energy therefore offers a useful case study of the questions raised above.

The primary objective of this study is to explore variations in stated WTP for renewable energy under the following four payment and provision contexts:

1. A **mandatory** increase in the electricity bills of all customers, the funds from which are collected and spent by the **government** on renewable energy projects.
2. A **voluntary** increase in the electricity bills of those customers who choose to pay, the funds from which are collected and spent by the **government** on renewable energy projects.
3. A **voluntary** increase in the electricity bills of those customers who choose to pay, the funds from which are collected and spent by **electricity suppliers** on renewable energy projects.
4. A **mandatory** increase in the electricity bills of all customers, the funds from which are collected and spent by **electricity suppliers** on renewable energy projects.

These payment and provision scenarios are consistent with contemporary forms of support for renewable energy. The first scenario – mandatory payments and government provision – is consistent with a system-benefits charge policy, a policy that has been adopted in 14 U.S. states. The third scenario – voluntary payments to an electricity supplier – is consistent with competitive green power marketing. The fourth scenario – mandatory payments through electricity suppliers – is consistent with a renewables portfolio standard, a policy adopted in ten U.S. states as of early 2002. The second scenario – voluntary payments and government provision – has only been used in a limited fashion in the United States.

In addition to having contemporary policy relevance, these four contingent valuation scenarios allow one to distinguish differences in stated WTP based on: (1) the payment method – is WTP affected by whether payments are to be made collectively or voluntarily? and (2) the provision arrangement – does the manner in which a good is provided, in this case through the government or the private sector, affect stated WTP? A split-sample, dichotomous choice contingent valuation survey of 1,574 U.S. residents was developed and implemented to test the sensitivity of stated WTP to these variables at three different payment levels, or bid points.

Three secondary objectives also influenced research design, and are discussed in this chapter. First, I indirectly and tentatively evaluate the importance of "participation expectations" in contingent valuation surveys: specifically, are individuals who state a WTP for renewable energy more likely to think that others will also contribute? Such relationships are commonly discussed in the sociology, social psychology, and marketing literatures, and are also frequently referenced in the collective action literature, but have yet to be tested thoroughly in a contingent valuation context. Second, I assess the effects of socioeconomic, demographic, and attitudinal variables on willingness to pay for renewable energy through regression analysis. This analysis helps test the construct validity of the contingent valuation method, and informs our understanding of who is and is not willing to pay for renewable energy under different payment and provision contexts. Finally, through the implementation of an opinion survey with 202 respondents, I compare the results of the CV surveys to a more direct approach of eliciting individuals' payment preferences. Responses to the opinion survey also allow a deeper exploration of other issues related to payment preferences.

Results presented here have important implications for the methodology and practice of contingent valuation. In particular, the results shed light on strategic response behavior and the incentive compatibility of different CV designs, as well as the appropriate interpretation of criterion validity studies. This work also helps one better understand the discrepancy between environmental attitudes (and purchase intentions) as expressed through consumer surveys and actual consumer behavior, and sheds light on the collective action literature more broadly. Finally, because the valuation scenarios are consistent with contemporary renewable energy programs, results provide practical insight on the preferences of the U.S. populace towards various approaches to encouraging renewable energy supply.

This chapter begins with an overview of the contingent valuation method and a summary of previous CV research that relates to the issues covered in the following pages. The good valued in the present CV application – renewable energy – is then described. A summary of the survey questionnaire and the methods used to perform the survey is provided. Results and analysis are then presented. The chapter concludes with a discussion of the implications of this study for the practice of contingent valuation, for understanding the relationship between stated WTP and one's expectations for the participation of others, and for policymakers and marketers interested in supporting renewable energy.

6.2 The Contingent Valuation Approach

6.2.1 The Basics of Contingent Valuation

Contingent valuation surveys are claimed by their proponents to provide a methodologically rigorous way to ask willingness to pay questions and value public goods. Since its conception by Ciriacy-Wantrup in 1947, contingent valuation has become one of the most popular methods used by environmental and resource economists to value environmental goods (Mitchell and Carson 1989, Bjornstad and Kahn 1996, Bateman and Willis 1999). Contingent valuation uses a questionnaire or interview to create a realistic but still hypothetical market or referendum. The survey (1) conveys the description of the good to be valued, (2) describes the payment method and amount to be paid, and then (3) allows respondents to indicate their willingness to pay for the good in question.

During the development of the method, and especially since the 1970s, contingent valuation has undergone numerous methodological tests to assess the reliability and accuracy of the approach. Question wording and ordering, differences between willingness to pay and willingness to accept, treatment of "don't know" responses, scope and embedding effects, elicitation effects, statistical issues, survey mode effects, criterion validity studies, temporal reliability, and starting point bias are among the types of considerations evaluated in the CV literature to date. Despite growing acceptance by some of the usefulness and meaningfulness of CV responses, however, the technique remains controversial (Cummings and Harrison 1994, Hausman 1993).

To help fill important gaps in the CV literature, Bjornstad and Kahn (1996) identify several research areas that require attention, including the role of CV context in the formation of preferences, and the impact of payment methods on elicited WTP. These are the topics of this chapter, and below I discuss relevant CV literature that addresses the principal payment and context effects that are explored in this paper: the provision arrangement (government vs. private), and the payment method (collective vs. voluntary).

6.2.2 Provision and Payment Effects in Contingent Valuation

That the approach taken to collecting and spending funds for environmental projects may influence the willingness of individuals to provide those funds should come as little surprise. As succinctly stated by Johnson et al. (1999), "Whereas contingent valuation method surveys generally address the payment mechanism as a simple means to assess realistic monetary tradeoffs and measure dollar-denominated welfare impacts, characteristics of the payment mechanism itself may have important impacts on respondents' perceptions of specified dollar amounts and their willingness to pay for multidimensional policy packages."

A number of CV researchers have sought to understand the impacts of provision and payment methods on responses to CV questions. Such tests have explored the impacts of payment vehicle (e.g., sales taxes vs. water fees),[51] payment timing (e.g., lump

[51] See, e.g., Greenley et al. (1981), Randall et al. (1974), Brookshire et al. (1980), Rowe et al. (1980), Blamey (1998).

sum payment versus monthly payments),[52] and faith in the payment method as an efficient and guaranteed funding source.[53] Differences in response among these treatments are viewed by some as evidence of the unreliability of the CV method, and CV researchers once referred to such differences as payment vehicle bias (Diamond and Hausman 1994, Rowe and Chestnut 1983). Most economists and CV researchers, however, now acknowledge that such subtle changes to the CV scenario can and in some cases should elicit different willingness to pay responses, and can do so without damaging the reliability of the CV method (Hanemann 1994, Mitchell and Carson 1989, Fischhoff and Furby 1988). As one example, while the typical CV survey does not allow for the fact that respondents may assume some inefficiency in fund collection and expenditure, as a practical matter it should be clear that respondents' views of policy inefficiency may vary by the approach taken to the provision of the good.

6.2.3 The Provision Arrangement: Government versus Private Delivery

Building on previous CV research, in the present study I consider two ways in which the good – renewable energy – could be provided. One approach is for the government to collect and distribute funds for renewable energy; the other is for a private electricity supplier to collect and spend the funds. I know of no other CV study that has looked at the relative WTP of respondents for government or private delivery of a public good. A priori, economic theory can do little to predict how or if WTP will differ based on this variation in the CV scenario. One might expect, however, that any difference in

[52] See, e.g., Brookshire et al. (1981), Stevens et al. (1997).
[53] See, e.g., Johnson et al. (1999).

WTP across the two provision arrangements will be driven by the relative trust respondents place in the government and the private sector in effectively delivering renewable energy programs.

6.2.4 The Payment Method: Collective versus Voluntary Collection

I also evaluate two possible payment methods. The first is a collective payment approach is which all households and businesses are required to pay for the provision of the good; in the case of renewable energy, this takes the form of a required surcharge on electricity bills. The second payment method is a voluntary one in which each household has the option, but not the obligation, to support the provision of the good; in the case of renewable energy, this is envisioned as a voluntary supplemental charge on electricity bills, consistent with voluntary green power marketing.

There have been relatively few efforts within the CV literature to systematically test the sensitivity of willingness to pay to whether payments are to be made collectively or voluntarily. It is here that my study can contribute to a better understanding and critique of the CV methodology, and to broader literatures related to the collective action dilemma and the gap between general environmental attitudes and specific behaviors.

Though some critics of contingent valuation have argued that any difference in WTP under voluntary and collective payment methods would demonstrate bias in CV (Green et al. 1994), such statements are simply false. Instead, a review of the CV, collective action, experimental economics and related literatures leads to two conflicting theories of behavioral response when individuals are faced with these payment options, discussed below under the headings “free riding and truth telling” and “strategic behavior and incentive compatibility."

Free Riding and Truth Telling

One behavioral theory relies on the traditional economic concept of "free riding." As previously discussed in this dissertation, when payment is voluntary, economic theory predicts that few individuals will be willing to pay to help provide public goods. While collective payments may be supported as a way of providing important public benefits, those same people would take a "free ride" and not contribute in the case of voluntary efforts. The free riding concept has been used to explain the large discrepancy between the stated environmental attitudes of the general populace and the weak actions of that same group in voluntarily engaging in environmental behaviors (Foster et al. 1997). The theory has also been tested in experimental economic research. While complete free riding is not generally found, the evidence for a significant degree of such behavior is clear (Ledyard 1995). Finally, within CV research, this theory has been used to explain why actual contributions to public causes are often well below what CV studies would seem to predict (Carson 1997, Taylor 1998, Hanemann 1996). If survey respondents are assumed to answer CV questions "truthfully" (i.e., as if they are being faced with a true economic choice to voluntarily contribute), free riding might be used to predict that stated WTP under voluntary payment will be far lower than elicited WTP when payments are to be made collectively.

Strategic Behavior and Incentive Compatibility

While few would doubt the powerful incentive to free ride when real economic commitments are involved, CV studies rely on hypothetical survey questions, not real commitments. For free riding, as defined above, to dominate behavior in a CV context, one would have to assume that respondents answer CV questions – whether payment is collective or voluntary – as if they involved real economic commitments. The hypothetical nature of CV research leads to another possible behavioral response that economic theorists will be more amenable to than "truth telling": strategic behavior and overbidding.

Understanding the strategic incentives of CV respondents has been of concern throughout the development of the contingent valuation method. Concerns over strategic bias in public goods valuation are often attributed to Samuelson (1954), with perhaps the first test of these effects in a CV context by Bohm (1972).[54] Even now, however, the concept of strategic behavior and the related concept of "incentive compatibility" have only begun to be fully integrated into CV design.

Incentive compatibility refers to whether respondents to a CV survey (or in any other setting) have an incentive to reveal their true valuation – or willingness to pay – for the good. Perhaps the most significant recent contribution to the incentive compatibility literature as it relates to CV studies and different payment methods comes from Carson (1997) and Carson et al. (1999). These studies conclude that for a survey to elicit true preferences, it needs to be consequential; that is, the survey results must be viewed by the respondent as possibly influencing actual outcomes that the respondent cares about. Following Hoehn and Randall (1987), these authors also make a persuasive case that a

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[54] For other attempts to explore this subject, see Lunander (1998), Cronin and Herzeg (1982), Rowe et al. (1980), and Posavac (1998).

single, binary dichotomous choice survey question (i.e., a yes/no valuation question) with a *collective* payment rule is an essential element of an incentive compatible survey design. In effect, such a design mimics the administration of a policy referendum, and is one of the primary reasons for the NOAA panel recommendation to use dichotomous choice elicitation methods (Arrow et al. 1993). This is also the design that I use in the collective payment cases.

In the case of *voluntary* contributions to the provision of public goods, however, Carson (1997) and Carson et al. (1999) identify an important possible cause of strategic behavior: option value. Specifically, these authors argue that respondents may overstate their WTP for a good when presented with a hypothetical, voluntary payment mechanism. In fact, as long as the good is *potentially* desirable, it is always optimal to say "yes" to a survey valuation question that poses a voluntary payment. This is because the only influence of a "yes" response to a hypothetical CV question is to encourage the actual fund-raising effort, and many respondents may want the good to be provided by others or may want the option of actually volunteering to pay for the good at a later time. Thus, the "optimal" strategy for many respondents when faced with a voluntary payment for a public good is to say "yes" to the hypothetical CV question and to then free ride and say "no" to the actual fund raising effort. Importantly, this is true for both public and private goods; in the private good case, a "yes" response in the survey encourages the production of the good while the respondent gets to decide later whether to actually purchase the good. Consequently, in a hypothetical survey context, a conniving respondent may overstate their WTP in a voluntary payment setting in order to ensure that the option to actually pay for the good is available at a later time.

Related CV Research

These two theories of behavioral response suggest opposite effects. Free riding and truth telling argue that WTP under the voluntary payment method will be lower than under collective payment. Strategic behavior suggests the opposite effect, with voluntary WTP exceeding collective WTP in a survey context. By attempting to mimic an incentive compatible design in the collective payment context and a design that is not incentive compatible under voluntary payment, my research is able to assess the combined impact of these two response effects. In so doing, it contributes to the limited CV research in this area.

Many early CV studies used voluntary payment methods to elicit WTP. Recognizing that such an approach fails the test of incentive compatibility, however, most contemporary CV research uses collective payment vehicles. Surprisingly, however, only a limited amount of empirical work has been undertaken to explore the differences between voluntary and collective WTP, and much of the work that does exist suffers from serious methodological shortcomings. I review some of this existing literature below.

A number of studies have found no difference in collective and voluntary WTP. Milon (1989), using an approach closest to the one used in this paper, evaluates collective and voluntary WTP for an artificial reef using a dichotomous choice elicitation format. No significant differences in WTP are found. Ajzen et al. (1996) also evaluate WTP for a public (movie theater) and private (noise filter) good under voluntary and compulsory payment vehicles. Using a within-sample approach and open-ended response format, they also find that the payment method has little impact.[55] An earlier study by Babb and Sherr (1975) similarly found little evidence of strategic behavior when respondents are faced with a voluntary payment mechanism.

Other studies do find some evidence for different response effects when individuals are confronted with collective and voluntary payment vehicles. Green et al. (1994), using an open-ended elicitation format, find limited evidence for higher WTP estimates under a taxation arrangement than under voluntary contributions. Hanley and Milne (1996) evaluate whether respondents would be willing to exchange lower "personal" or "community" income to improve environmental quality; while these authors find some difference in response based on personal or community income, they do not define for the respondent what they mean by these terms, making meaningful interpretation of their results impossible. In a pilot study with an open-ended elicitation format, Bateman et al. (1995) found that a voluntary payment vehicle suffered disproportionately from zero WTP bids compared to a taxation vehicle, and also generated lower mean WTP estimates. Stevens et al. (1991), meanwhile, find that, when confronted with a voluntary payment method for protecting wildlife, 40% of respondents who indicated they were not willing to pay stated that wildlife should be preserved through taxes or license fees. Similarly, Harris and Brown (1992) present survey respondents with a choice of four payment methods for a reduction in wildlife impacts; the majority of respondents preferred collective payment methods. Guagnano et al. (1994) assess WTP under collective and voluntary payment regimes for rainforest

[55] It should be noted that the authors do not emphasize this point and provide limited evidence for this conclusion.

protection and water cleanup. Using an open-ended format, a nonstandard WTP question in the collective case, and a collective tax vehicle whose duration is unclear, they find that WTP under collective payment is lower than under voluntary payment.[56]

The study presented here more comprehensively explores WTP under collective and voluntary payment mechanisms. It makes advances relative to much of the previous research by: (1) undertaking a complete CV study rather than a pilot study, (2) carefully designing the valuation questions to distinguish between voluntary and collective willingness to pay, (3) implementing the survey through standard CV procedures, including dichotomous choice elicitation and a split sample design, (4) including other questions in the CV survey to better understand responses received, and (5) undertaking an opinion survey with which to compare CV response. By so doing, I am able to explore individuals' payment preferences for renewable energy and test for the offsetting influences of strategic bidding and truth telling/free riding in a particular CV application.

6.3 The Environmental Good: Renewable Energy

My exploration of payment preferences and behavioral response in CV surveys is based on a study of willingness to pay for renewable energy. Renewable energy sources include wind, biomass, solar, geothermal, and hydropower. With the exception of hydropower, renewable electricity is often more costly than traditional natural gas and coal generation. Nonetheless, use of these resources can provide public environmental,

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[56] There have also been loosely related efforts to value private and collective protection of risks (Crocker et al. 1998).

fuel source diversity, and economic development benefits by offsetting traditional forms of electric production.

Renewable energy has historically been supported in the U.S. and worldwide through a number of public policy efforts: tax incentives, favorable power purchase contracts, set asides, grant programs, etc. Under each of these policies, the extra cost of renewable energy is recovered collectively through mandatory increases in electric bills or taxes. More recently, however, the introduction of customer choice in electricity markets has given end-use customers the ability to voluntarily support renewable energy through extra payments on their electricity bills.

Several opinion surveys have been conducted over the last five years to explore individual preferences for supporting renewable power generation. There is some evidence that U.S. residents prefer collective, mandatory payments for renewable energy to voluntary ones. Sloan and Taddune (1999) report that four “deliberative polling” exercises in Texas found that 47-71% of customers prefer to spread at least some of the costs of renewable energy over all customers, while 17-45% of customers prefer that all payments be made voluntarily. ECAP (1998) similarly finds that 58% of respondents express a preference for spreading the cost of renewable energy over all customers, while 37% prefer voluntary payments. Other surveys (Ferguson 1999) and focus groups (Decision Research 1992, Farhar and Coburn 1999, Farhar 1999) have found similar results. As presented in Chapter 4, non-residential green power purchasers are also found to prefer collective policy measures to voluntary payments as the primary means of supporting renewable energy.

None of these opinion surveys have relied on the contingent valuation method.

Moreover, while numerous studies have asked consumers' WTP for renewable energy, only three such studies have formally used the contingent valuation approach. In each of these cases, the primary purpose of using CV was to test for criterion validity; that is, the difference between stated willingness to pay in a hypothetical CV context and actual WTP as demonstrated through market transactions. Champ and Bishop (1998), for example, explore WTP for wind power under different elicitation methods (dichotomous choice and payment card) and based on hypothetical and actual payments. They find that a *hypothetical*, dichotomous-choice contingent valuation survey substantially overestimates response compared to either a dichotomous choice or payment card approach that solicits *actual* contributions. A second major study of a similar kind is reported in Ethier et al. (2000), Poe et al. (1997), and Rose et al. (1997). Using a provision point mechanism, they find that a dichotomous choice CV survey overestimates actual response by approximately 30%, while the results from an open-ended elicitation format approximates actual response. Finally, Byrnes et al. (1999) find that response to a hypothetical green power offer greatly exceeds that for an actual offer.

6.4 Data and Methods

6.4.1 Research Design

This analysis of individual preferences for different payment methods and provision arrangements is based on data from a single-bounded, dichotomous choice CV survey of 1,574 U.S. households, and from data from 202 respondents to an opinion survey. The CV study crossed payment method (collective or voluntary) and provision arrangement (government or private), yielding a four-cell experimental design summarized in Table 6-1. A split-sample design was employed: each respondent received a different CV question corresponding to one of the four CV payment and provision scenarios described in the introduction to this chapter and summarized in Table 6-1. Within each of these four independent samples, three different bid points were used (50¢/month, $3/month and $8/month), for a total of 12 survey variations, yielding four distinct WTP distributions.[57]

Table 6-1. Four Contingent Valuation Scenarios

Voluntary or Collective Payment

Degree of Gov't Involvement

SCENARIO 2 Voluntary Payment, Government Provision	SCENARIO 1 Collective Payment, Government Provision *(consistent with a system benefits charge)*
SCENARIO 3 Voluntary Payment, Private Provision *(consistent with competitive green power marketing)*	SCENARIO 4 Collective Payment, Private Provision *(consistent with a renewables portfolio standard)*

A final sample received an (non-contingent valuation) opinion survey intended to cover many of the same topics as the CV survey, but to more directly query respondents on their payment preferences. A comparison of the results from this latter survey with the CV surveys is provided in Section 6.5.7.

[57] Each of the CV and opinion surveys also had two versions corresponding to a randomization of question response categories, for a total of 26 survey versions.

6.4.2 Survey Sample and Response Rate

The survey was conducted as a mail questionnaire to minimize cost (and therefore increase sample size) and to ensure that more complex concepts could be conveyed than is possible in a telephone survey.[58] The population of interest for this research consisted of U.S. residents who pay their own electric bills. The sample frame, meanwhile, included U.S. residents listed in telephone directories with complete telephone and address information; because this is a listed sample, the sample frame excludes all residents with unlisted telephone numbers and incomplete address information. The sample itself was purchased from Survey Sampling Inc., and residents were selected and sampled randomly in proportion to their occurrence in the 50 states. Of course, not all sampled residents pay their own electricity bill. The survey was therefore designed with a screening question early on to identify and exclude those respondents who do not pay their own electric bill.[59]

Table 6-2 summarizes the sample size, valid starting sample, completed surveys, and survey response rate achieved by the mail survey. As shown, the aggregate response rate to the CV surveys (and the opinion survey) is over 45% (not including responses to the abbreviated survey by telephone, discussed below). There are no statistically significant variations in response rate by CV scenario or by bid amount (chi(2) test, p =

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[58] Though mail surveys are the most common way of collecting CV data, CV researchers often prefer to use telephone surveys or in-person interviews if cost is not a factor. Telephone surveys and in-person interviews often yield higher response rates than mail surveys and can allow the interviewer to assess the thoughtfulness of the responses that are received. Telephone interviews, using random digit dialing, may also reach a more complete sample of households than a mail survey, which by necessity must use a listed sample. The advantages of mail surveys include lower costs, an ability to convey more complex concepts than through telephone interviews, and a reduction in interviewer bias. Debates continue in the CV literature on the relative advantages and disadvantages of these various data collection procedures.

[59] Those households that do not pay their own electric bill answered this question early in the survey, and were asked to return the otherwise blank survey.

0.985). A total of 4,056 CV surveys and 544 opinion surveys were mailed; 1574 completed CV surveys and 202 completed opinion surveys were returned. For each CV bid level, 338 surveys were distributed, with returns ranging from 111 to 141. While a 45% response rate is not atypical when using the mail survey procedures further enumerated below, it must be recognized that respondents to the survey may have different demographic, socioeconomic, and attitudinal characteristics than those who chose not to respond, a point to which I return in 6.4.5.

Table 6-2. Survey Response Rates

Survey Version	**Total Mailed**	**Undeliv.**	**Ineligible***	**Valid Starting Sample**	**Mail Completes**	**Response Rate**
CV – Scenario 1	1014	154	20	840	376	44.8%
50¢/month	*338*	*49*	*8*	*281*	*130*	*46.3%*
$3/month	*338*	*53*	*7*	*278*	*111*	*40.0%*
$8/month	*338*	*52*	*5*	*281*	*135*	*48.0%*
CV – Scenario 2	1014	151	15	848	390	46.0%
50¢/month	*338*	*54*	*4*	*280*	*130*	*46.4%*
$3/month	*338*	*47*	*4*	*287*	*137*	*47.7%*
$8/month	*338*	*50*	*7*	*281*	*123*	*43.8%*
CV – Scenario 3	1014	138	11	865	407	47.1%
50¢/month	*338*	*49*	*3*	*286*	*125*	*43.7%*
$3/month	*338*	*43*	*4*	*291*	*144*	*49.5%*
$8/month	*338*	*46*	*4*	*288*	*138*	*47.9%*
CV – Scenario 4	1014	140	20	854	401	47.0%
50¢/month	*338*	*41*	*8*	*289*	*136*	*47.1%*
$3/month	*338*	*48*	*7*	*283*	*124*	*43.8%*
$8/month	*338*	*51*	*5*	*282*	*141*	*50.0%*
TOTAL CV	**4056**	**583**	**66**	**3407**	**1574**	**46.2%**
Opinion Survey	544	90	9	445	202	45.4%
TOTAL (opinion and CV)	**4600**	**673**	**75**	**3852**	**1776**	**46.1%**

* Respondent does not pay own electric bill or is deceased.

6.4.3 Survey Design and Protocol

Design Process and Pre-testing

The contingent valuation (and opinion) surveys were designed over a one-year period. Initial survey design began in early- to mid-2000 with an extensive review of the CV literature and example CV surveys. Comments on successive revisions of the surveys were received from professional colleagues and dissertation committee members. An informal focus group of six individuals was held in October 2000 to test the CV survey questions and associated mailing package (e.g., cover letters, reminder post cards, etc.).

PA Consulting, Inc. was hired to administer the surveys, including a full pre-test of the instrument, and to enter, code, and clean the data received. PA Consulting also provided useful comments on survey design, question wording, and formatting. The pre-test was held in November and December of 2000 and involved mailing 206 surveys to California residents.[60] Six CV surveys (three payment methods, each with two bid levels) and the opinion survey were all tested. The pre-test was designed to test appropriate bid levels, survey procedures, expected response rate, and (to some extent) question wording. The survey protocol for the pre-test included: an advance letter, the survey mailing, a reminder postcard, a second survey mailing, and a reminder phone call (3 tries). During the reminder phone call, an abbreviated version of the full survey was also administered. In aggregate, after deleting undeliverable surveys and those respondents who do not pay their own electric bill, a response rate of 55% was achieved. If responses to the

[60] Though I initially intended the final survey to focus on California residents, the emerging electricity crisis in that state convinced me to use a national sample for final survey implementation.

abbreviated telephone survey are included, the response rate for the pre-test jumps to 65%.

Survey Protocol

Based on successive changes to the survey questions, formatting, and procedures, the final survey was administered from 15 February to 21 May 2001. The survey was formatted and administered in a fashion largely consistent with that recommended by Dillman (2000) in order to maximize response rates at reasonable cost. The following data collection procedures (largely mirroring those used for the pre-test) were used:

- **Advance Letter:** This letter, mailed on University of California at Berkeley letterhead, informed sampled residents that they had been selected to participate in the study, told them of the study's purpose, and indicated to them that they would be receiving a survey in the mail within the next couple days (see Appendix C for copies of all of the contact letters).
- **Initial Mail Survey Package:** The advance letter was followed several days later by a package consisting of a cover letter from the University of California explaining the study, one 12 page CV or 16 page opinion survey booklet, a $1 cash incentive to encourage response, and a postage-paid return envelope.
- **Thank You/Reminder Postcard:** All sampled residents were mailed a postcard nine days after the initial mail survey was sent. The postcard thanked those who had responded and reminded those who had not yet responded to please do so.
- **Follow-up Mail Survey Package:** Those residents who had not yet responded to the survey after approximately 3 weeks of receiving the first survey were sent a

second copy of the survey booklet, a reminder letter, and a postage-paid envelope.

- **Follow-up Telephone Calls:** Finally, telephone calls to all non-responders (at least 3 attempts, 2,253 households) were conducted from 2-4 weeks after the follow-up survey mailing. As part of the telephone calls, sampled residents were asked whether they had received the survey and whether they had returned it. Those who had not returned the survey were asked to please complete the survey as soon as possible and return it. If needed, another copy of the survey was mailed the day after the telephone call. Telephone respondents were also asked to answer an abbreviated version of the CV and opinion surveys: 335 CV and 61 opinion surveys were completed in this fashion. Because these were abbreviated versions of the surveys, however, answers to the telephone surveys are not reported in detail in this chapter.[61]

Example copies of the contingent valuation and opinion mail surveys are provided in Appendix D and E, respectively. An example of the telephone script is reproduced in Appendix F.

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[61] It should be noted that any comparison of the telephone survey responses with the mail responses is confounded by a number of factors. First, the number of telephone responses does not allow for a reliable comparison of answers to the valuation question across survey modes. Second, the telephone survey was conducted after several attempts at eliciting a mail response, and respondents may therefore have different characteristics than those who responded to the mail survey. Third, the telephone survey was an abbreviated version of the mail survey. And finally, the telephone survey clearly used a different survey mode than the mail survey. That said, to test for possible non-response effects, Section 6.4.5 of this chapter provides a limited comparison of responses to the two survey modes.

6.4.4 The Survey Instrument and Valuation Scenarios

The CV survey questionnaire is 12 pages long and is divided into four sections. As is typical in contingent valuation, the first section of the survey contains "warm up" questions to get the respondent thinking about energy in general and renewable energy in particular, and to do so in a neutral fashion. Several of the questions are also designed to define terms used later in the survey. Five point, Likert-scale questions are used to provide respondents information on the possible benefits and costs of renewable energy. The questions included in this section of the survey, and their responses, are not highlighted in this chapter because they are unrelated to the primary purpose of the study. Responses to these questions are included in Appendix G for the interested reader (responses from the same questions in the opinion survey are omitted).

The second section of the CV survey contains the valuation exercise. This section begins with background information to (1) impress upon the respondent the policy relevance of their response, and (2) encourage respondents to think carefully about their response in the context of their household budget. The actual language can be seen in Appendix D. The valuation question follows. As noted earlier, each respondent received one of four CV valuation scenarios, which vary based on whether payment is voluntary or collective, and whether the funds are collected and spent by the government or by electricity retailers. Each respondent was presented with information on the valuation scenario, and the potential environmental impacts of the scenario were described. Finally, respondents were asked a yes/no question on whether they would be willing to pay or support a specified premium on their electric bill for three years to increase the supply of renewable energy.

Different surveys contained different proposed premiums. In particular, three bid points, or payment levels, were used: 50¢/month, $3/month and $8/month.[62] The number of bid points and their spacing was chosen based on research design considerations and on pre-test results. Rather than seeking an accurate estimate of the mean WTP, my interest was in comparing WTP responses across payment and provision contexts at each bid level. This resulted in a bid design with many observations at a small number of bid points as I sought to narrow the confidence interval around WTP at each bid point. Each of the four specific valuation scenarios is reproduced in Text Box 6-1 for the $3 bid level.

[62] I should note that this is not a standard contingent valuation study in which a single environmental good is being valued. In particular, in this survey higher bid levels correspond to more renewable energy being supplied and increased environmental improvements. This is consistent with the approach taken in several other CV studies (see, e.g., Berrens et al. 1998, Champ et al. 1997), but may be better classified as "contingent choice" than "contingent valuation."

Text Box 6-1. Four Contingent Valuation Scenarios

Scenario 1: Collective Payment, Government Provision
The federal government is considering a program where all homes and businesses in the United States would be required to pay a $3 surcharge on their monthly electricity bills for 3 years to increase the supply of renewable energy. This surcharge will be collected by the government and used to help fund the construction of more renewable energy projects. Because the proposed surcharge is mandatory, all homes and businesses will be required to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $3/month for 3 years will provide the same environmental benefits as not driving a car a total of 72,000 miles. Because every home and business would be required to pay this surcharge, renewable energy production in the United States would increase from 2% to 8%.

Remembering that all homes and businesses in the United States will have to pay the same amount if this policy is adopted, would your household support the adoption of this proposed monthly surcharge of $3 for 3 years (equal to $36 per year and $108 over the life of the program)?

Scenario 2: Voluntary Payment, Government Provision
The federal government is considering a program where all homes and businesses in the United States would be given the opportunity to voluntarily pay a $3 surcharge on their monthly electricity bills for 3 years to increase the supply of renewable energy. This surcharge will be collected by the government and used to help fund the construction of more renewable energy projects. Because the proposed surcharge is voluntary, many homes and businesses may decide not to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $3/month for 3 years will provide the same environmental benefits as not driving a car a total of 72,000 miles. If every home and business were to pay this surcharge, renewable energy production in the United States would increase from 2% to 8%.

Remembering that all homes and businesses in the United States will be able to individually decide whether to contribute and that many homes and businesses may decide not to pay, would your household volunteer to pay this proposed monthly surcharge of $3 for 3 years (equal to $36 per year and $108 over the life of the program)?

Text Box 6-1. Four Contingent Valuation Scenarios (continued)

Scenario 3: Voluntary Payment, Private Provision

The federal government is considering a program where all homes and businesses in the United States would be given the opportunity to voluntarily purchase their electricity from a private company that sells renewable energy. By switching to a private electricity provider and paying a $3 surcharge on their monthly electricity bills for 3 years, homes and businesses will help increase the supply of renewable energy. This surcharge will be collected by the private company and used to build more renewable energy projects. Because switching electricity providers and paying the proposed surcharge is voluntary, many homes and businesses may decide not to switch providers and not to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $3/month for 3 years will provide the same environmental benefits as not driving a car a total of 72,000 miles. If every home and business were to pay this surcharge, renewable energy production in the United States would increase from 2% to 8%.

Remembering that all homes and businesses in the United States will be able to individually decide whether to contribute and that many homes and businesses may decide not to pay, would your household volunteer to switch to a private electricity provider and pay this proposed monthly surcharge of $3 for 3 years (equal to $36 per year and $108 over the life of the program)?

Scenario 4: Collective Payment, Private Provision

The federal government is considering a program where all electricity suppliers (e.g., utilities) in the United States would be required to purchase some of their electricity from private companies that sell renewable energy. To meet this requirement, and to increase the supply of renewable energy, all homes and businesses in the United States would be required to pay a $3 surcharge on their monthly electricity bills for 3 years. This surcharge will be collected by each customers' electricity supplier and used by private companies that sell renewable energy to build more renewable energy projects. Because the proposed surcharge is mandatory, all homes and businesses will be required to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $3/month for 3 years will provide the same environmental benefits as not driving a car a total of 72,000 miles. Because every home and business would be required to pay this surcharge, renewable energy production in the United States would increase from 2% to 8%.

Remembering that all homes and businesses in the United States will have to pay the same amount if this policy is adopted, would your household support the adoption of this proposed monthly surcharge of $3 for 3 years (equal to $36 per year and $108 over the life of the program)?

To make clean comparisons across CV scenarios, I sought to design each scenario in a comparable fashion, varying only the payment method (collective or voluntary) and provision arrangement (government or private sector). Unfortunately, especially under the private sector provision scenarios, such comparability is not perfect. To make the scenarios credible and give them additional policy relevance, Text Box 6-1 shows that Scenario 3 has the respondent switching to a new electricity provider to pay the specified premium, while Scenario 4 imposes a renewable energy requirement on electricity suppliers, the cost of which would flow through to all customers. Scenario 3 is therefore consistent with competitive green power marketing, while Scenario 4 is consistent with a renewables portfolio standard or other renewable energy purchase mandate. Neither Scenario 1 nor Scenario 2 includes switching electricity suppliers or the imposition of a renewable energy requirement. Therefore, variations in Scenarios 3 and 4 beyond the specific treatment effects of payment method and provision arrangement must be considered when interpreting survey results. While this certainly makes it more difficult to derive definitive conclusions on the impact of payment and provision arrangements, it does make the scenarios consistent with current renewable energy support programs, offering a degree of social relevancy that would not have been possible if the scenarios had been designed differently.

For those respondents who said they were not willing to pay the specified premium, the next question queried them on their reasons. Meanwhile, respondents who indicated they were willing to pay were asked how certain they were about their response on a 5-point scale. Finally, all survey participants were asked what percent of U.S. residents they believe would support the mandatory or voluntary payment for the specific

CV scenario they received. Responses to this last question are used later in this chapter to test for relationships between the stated WTP of survey respondents and the expectations of those same respondents for the WTP of other U.S. residents.

The third section of the CV survey includes a series of questions with Likert-scale response categories. The questions include 10 agree/disagree statements that might be correlated with responses to the valuation question, including statements that relate to free-riding, bandwagon effects and participation expectations, trust in the government and the private marketplace, and early adoption. These statements, and a summary of the responses to the statements on a 5-point scale, are provided in Appendix G (again, I omit similar responses to the opinion survey here). Also included in this section of the survey is a question that asks which of a number of "environmental" activities the respondent does on a regular basis. Two questions that assess the degree to which respondents believe that individuals and the government can help solve a number of environmental problems are also included. Responses to these questions are also summarized in Appendix G, but are not highlighted in this chapter.

The final section of the survey collects demographic and socioeconomic information: age, sex, children, education, political leaning, and income.

The 16-page opinion survey is, in many respects, similar to the CV survey. The same warm up questions are used, and the same demographic and socioeconomic information is collected. Instead of a CV valuation scenario, however, respondents are simply asked several questions about how they believe renewable energy should be supported, if at all. The opinion survey also asks a number of questions about voluntarily purchasing renewable energy that are not included in the CV survey. These questions were included to assess the respondents' interest in voluntarily supporting renewable energy under a variety of conditions. The specific questions and their responses are reported later.

Appendices C through F present examples of all survey materials. Customer contact letters are presented in Appendix C. Appendix D provides illustrative examples of the contingent valuation surveys: Scenario 1 at the 50¢/month bid level, Scenario 2 at the $3/month bid level, Scenario 3 at the $8/month bid level, and Scenario 4 at the 50¢/month bid level. An example of the opinion survey is reproduced in Appendix E. Appendix F provides example telephone survey scripts for the contingent valuation and opinion surveys.

6.4.5 Descriptive Statistics of the Respondents and Tests for Non-Response Bias

Table 6-3 summarizes responses to the demographic and socioeconomic questions, as well as the location of the respondent's household (determined by address) and whether the respondent owns or rents their residence (included in the first section of the survey) for both the CV and opinion surveys. Importantly, there appear to be no systematic differences in the respondents by survey type or version. Therefore, one can assume that any differences that occur in WTP across the various survey versions are related to treatment effects, not differences in demographic or socioeconomic characteristics.

Table 6-3. Socioeconomic and Demographic Statistics by Survey Version

Variable	Response Categories	CV Sc.1	CV Sc.2	CV Sc.3	CV Sc.4	CV TOTAL	Opinion Survey
Residence Ownership	own	82%	81%	86%	81%	82%	84%
	rent/other	18%	19%	14%	19%	18%	16%
Age	17 or under	0%	0%	0%	0%	0%	0%
	18 to 24	2%	2%	2%	3%	2%	3%
	25 to 34	12%	10%	13%	12%	12%	11%
	35 to 44	19%	23%	18%	16%	19%	22%
	45 to 54	25%	23%	19%	26%	23%	24%
	55 to 64	17%	15%	21%	15%	17%	11%
	65 and over	26%	27%	28%	28%	27%	29%
Sex	male	58%	63%	60%	65%	62%	62%
	female	42%	37%	40%	35%	38%	38%
Children	yes	80%	79%	80%	76%	79%	77%
	no	20%	21%	20%	24%	21%	23%
Education	no school	0%	0%	1%	0%	0%	1.0%
	grade school	4%	2%	2%	3%	3%	2%
	some HS	4%	5%	5%	5%	5%	8%
	completed HS	21%	21%	23%	22%	22%	17%
	some college	29%	27%	23%	22%	25%	25%
	associate degree	8%	7%	7%	11%	8%	7%
	bachelors degree	18%	21%	21%	20%	20%	20%
	post graduate	16%	18%	20%	18%	18%	20%
Political Leaning	very conservative	12%	10%	9%	11%	10%	12%
	somewhat conservative	37%	36%	41%	37%	38%	37%
	neither cons. or liberal	32%	32%	26%	31%	30%	27%
	somewhat liberal	16%	17%	20%	20%	18%	19%
	very liberal	3%	4%	4%	3%	4%	5%
Household Income	<$10,000	5%	6%	4%	4%	5%	3%
	$10,000-$19,999	10%	6%	8%	8%	8%	10%
	$20,000-$29,999	11%	9%	12%	8%	10%	12%
	$30,000-$39,999	10%	12%	14%	17%	13%	12%
	$40,000-$49,999	11%	14%	14%	14%	13%	13%
	$50,000-$59,999	8%	10%	8%	8%	9%	12%
	$60,000-$69,999	7%	10%	7%	7%	8%	10%
	$70,000-$79,999	7%	8%	7%	8%	7%	4%
	$80,000-$89,999	7%	7%	6%	7%	7%	7%
	$90,000-$99,999	4%	5%	5%	3%	4%	6%
	$100,000-$149,999	13%	9%	10%	10%	11%	8%
	>$150,000	7%	6%	6%	6%	6%	5%
Region	Northeast	19%	23%	18%	15%	19%	16%
	Midwest	27%	26%	29%	29%	28%	27%
	South	32%	30%	34%	33%	33%	33%
	West	22%	21%	18%	23%	21%	24%

Two standard concerns in survey research are those of non-response and coverage bias. Non-response bias relates to whether individuals who fail to respond to a survey have different characteristics and attitudes than those who do respond, whereas coverage bias deals with whether the sample frame adequately covers the target population. The best way to control for these effects, of course, is to achieve a high response rate to the survey and to carefully design one's sample frame. Even after taking exhaustive steps to improve the response rate, however, the majority of individuals in my sample (55%) failed to respond. And, by using a listed sample, my sample frame excludes individuals who are in my target population but who have unlisted telephone numbers or incomplete address information. Fortunately, results from my survey offer two ways of (imperfectly) testing for these effects.

The first approach is to compare the demographic and socioeconomic characteristics of the respondents to the survey with U.S. Census data on the characteristics of the U.S. population as a whole. In so doing, some differences become apparent. Specifically, compared to 2000 Census estimates, respondents to this survey appear better educated (92% completed high school compared to 82% in the census, and 38% have a bachelor's degree or higher compared to 25% in the census), have higher incomes ($67,000 mean household income compared to $55,000 in the census), are more likely to be male (62% male compared to 49% among the larger population), and are more likely to own their own household (82% compared to 66% in the census) than the general population. These differences may be caused by either coverage or non-response bias, and should therefore be considered when interpreting the results of my survey. It is important to acknowledge, however, that these differences may also simply reflect differences in target populations: the Census targets all U.S. residents while my survey targeted only those residents who pay their own electric bill. This makes strong conclusions about non-response and coverage bias on this basis impossible.

A second, more controversial approach to testing for non-response effects is to evaluate the relative characteristics of early and late respondents to a survey. Those individuals who respond to the survey only after several prods may have characteristics that more closely resemble those of non-respondents than those individuals who respond quickly to survey mailings. By testing for differences between early and late respondents, one can (theoretically) indirectly test for non-response bias. To test for this effect, here I compare the results of the mail CV survey with the results from the abbreviated telephone CV survey, which took place late in the survey process. All the caveats offered in an earlier footnote (footnote 61) on making these comparisons hold here. Table 6-4 shows the results of the comparison.[63]

As shown, telephone and mail respondents vary somewhat. Most significantly, telephone respondents are more likely to be female and are more likely to say they are willing to pay for renewable energy. Telephone survey respondents also tend to be somewhat younger and have slightly lower educational levels.

[63] It deserves mention that some of the respondents to the telephone survey also responded to the mail survey, creating some overlap between these two samples.

Table 6-4. Non-Response Effects: Mail and Telephone CV Survey Comparison

Variable	Response Categories	Mail CV Responses	Telephone CV Responses
Residence Ownership	own	82%	81%
	rent/other	18%	19%
Age	17 or under	0%	0%
	18 to 24	2%	3%
	25 to 34	12%	15%
	35 to 44	19%	24%
	45 to 54	23%	25%
	55 to 64	17%	12%
	65 and over	27%	21%
Sex	male	62%	48%
	female	38%	52%
Education	no school	0%	0%
	grade school	3%	4%
	some HS	5%	6%
	completed HS	22%	29%
	some college	25%	25%
	associate degree	8%	8%
	bachelors degree	20%	13%
	post graduate	18%	15%
Political Leaning	very conservative	10%	14%
	somewhat conservative	38%	37%
	neither cons. or liberal	30%	23%
	somewhat liberal	18%	22%
	very liberal	4%	4%
Willingness to Pay for Renewable Energy	yes	54%	63%
	no	46%	37%

Overall, these results suggest that some level of non-response and coverage bias exists, but assessing the magnitude or importance of the bias with these results alone is difficult. Comparing survey results with Census data is imperfect given different target populations, while comparisons between telephone and mail survey responses confound non-response bias with survey mode and other effects. Overall, a comparison with Census data suggests a non-respondent population that may be less interested in supporting renewable energy (lower education and income, and more renters), while a comparison to telephone survey responses appears to support the opposite conclusion (those responding later to the survey appear more willing to pay for renewable energy). The impacts of non-response and coverage effects on the survey results presented in this chapter are therefore ambiguous.

6.5 Survey Results

Pertinent survey results and analyses are presented here, with implications described in subsequent sections of the chapter. This section begins by summarizing responses to the four CV valuation scenarios, and evaluating whether systematic differences in willingness to pay based on payment method and provision arrangement are observable. As another gauge of systematic response differences, I then report results from a follow-up question that assessed the certainty ascribed to a “yes” response to the valuation scenario. I also present a summary of why certain survey participants said they are unwilling to pay the requisite premium, and highlight those survey results that explore the relationship between stated WTP and one’s expectations for the participation of others. The discussion then turns to multivariate regression analysis to further evaluate the influence of payment and provision context, the importance of participation expectations, and the impact of socioeconomic, demographic, and attitudinal variables on the probability of a “yes” response to the WTP question. This section concludes with a summary of results from the opinion survey.

6.5.1 CV Valuation Scenarios and WTP Distributions

The most direct way to test for payment and provision effects in the data is to compare the empirical distribution of WTP responses across the four CV scenarios. Table 6-5 shows the results of the four basic valuation scenarios at each bid point, or payment level. Figure 6-1 shows the important pair wise comparisons among the scenarios, illustrating the separable effects of payment method (voluntary vs. collective) and provision arrangement (government vs. private).

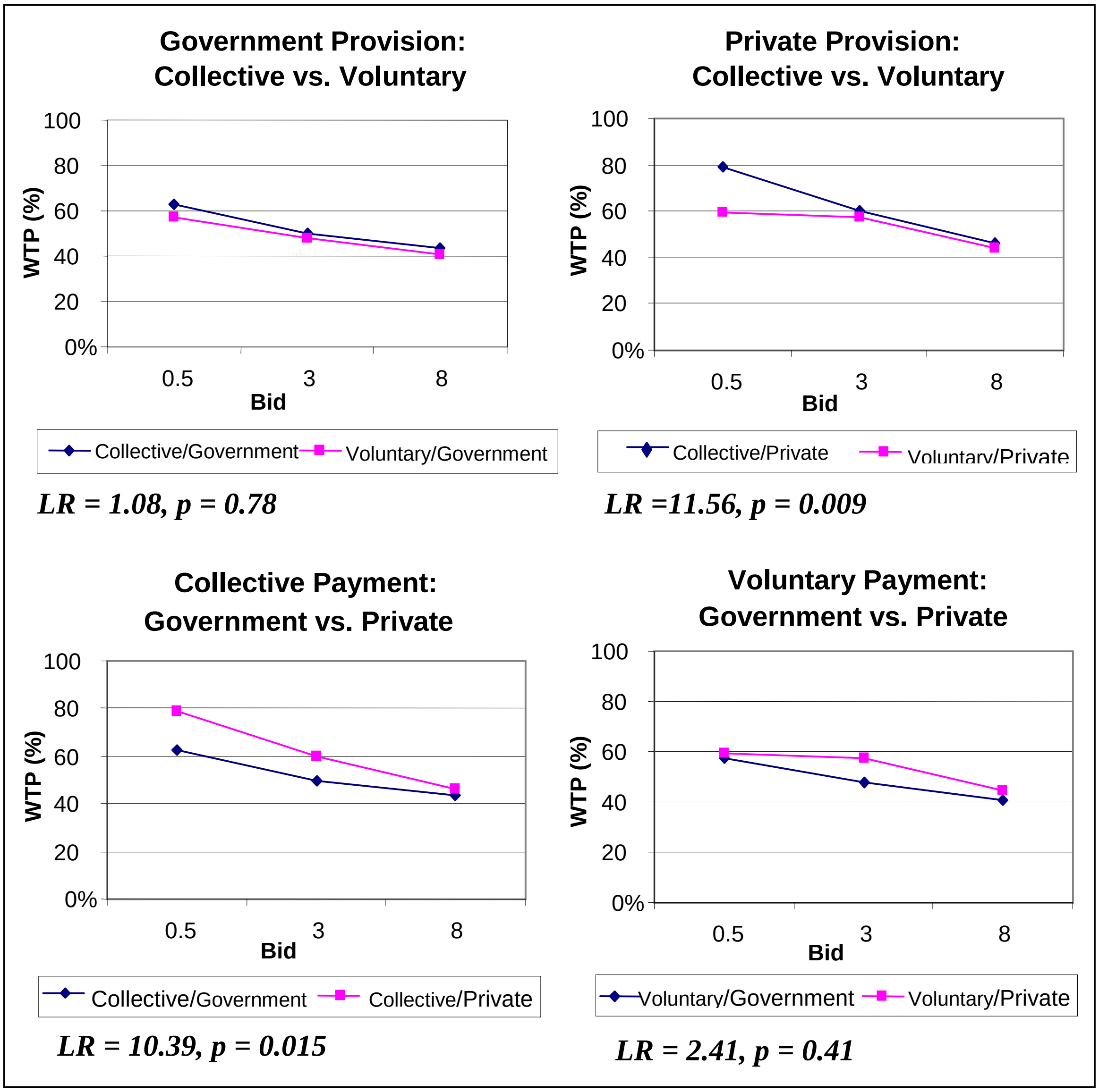
Table 6-5. Percent of Respondents Willing to Pay by Scenario and Bid

CV Scenario		**Bid Amount**	
	50¢ /month	$3/month	$8/month
Scenario 1: Collective Payment, Government Provision	62.9%	50.0%	43.5%
Scenario 2: Voluntary Payment, Government Provision	57.5%	47.7%	40.8%
Scenario 3: Voluntary Payment, Private Provision	59.1%	57.4%	44.3%
Scenario 4: Collective Payment, Private Provision	78.9%	60.0%	46.3%

* The one “don’t know” response to the valuation question was recoded as a “no.”

Several qualitative conclusions can be reached from these data. First, response to the WTP question appears to vary by both the CV scenario presented and by the payment level. As expected, higher monthly payments elicit a lower WTP; this is true for all scenarios. In addition, Scenario 4 – collective payment, private provision – elicits the highest WTP of all four payment and provision combinations. Scenario 2 – voluntary payment, government provision – elicits the lowest WTP.

Figure 6-1. WTP Responses by Scenario and Bid Level



Second, some systematic differences among response to the CV scenarios appear to exist depending on the payment method and provision arrangement. These effects are illustrated by the WTP distributions shown in Figure 6-1. The top two graphs embedded in Figure 6-1 show pair wise comparisons where the provision approach is fixed and the payment method varies. Under both provision modes (government and private), the collective payment method elicits a higher WTP at all bid points than does voluntary payment. Similarly, the bottom two graphs in the figure show pair wise comparisons where the payment method is fixed and the provision arrangement varies. Under both payment methods (collective and voluntary), the private provision arrangement elicits a higher WTP at all bid points than does government provision. These results suggest that collective payment methods elicit a higher WTP than voluntary ones, and that private provision arrangements elicit a higher WTP than governmental ones.

Third, while some systematic differences do appear to exist, these differences are not always sizable. To determine whether the qualitative conclusions reached above are statistically defensible, statistical tests are required. The statistical test used here is a likelihood ratio test for the equality of two binomial variables.[64] I first apply this test to each of the four pair wise comparisons shown in Figure 6-1, as opposed to each data point; that is, I compare the WTP "curves" as opposed to simply the individual points on each curve. This allows one to evaluate whether the different treatments (payment method and provision arrangement) yield statistically distinct responses on "average" across all bid points.

The mathematics behind this test are described in the footnote,[65] while results are presented in Figure 6-1 under each of the four pair wise comparison graphs. "LR"

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[64] I thank Tim Beatty, a graduate student in U.C. Berkeley's Agricultural and Resource Economics, for developing this test and helping me appreciate its usefulness.

[65] For a single bid point, consider two different samples: A and B. To test whether the binomial parameter θ in samples A and B is the same ($\theta_A = \theta_B = \theta$) or different ($\theta_A \neq \theta_B$) a simple likelihood ratio test may be used. Pooling the two samples, the restricted log-likelihood function will equal:

$$\sum_{i=1}^{n}\left(y_i \ln\theta + (1-y_i)\ln(1-\theta)\right)$$

The unrestricted log-likelihood function will be:

represents the test statistic of the likelihood ratio test. When compared to critical values on the chi-squared distribution, "p" represents the statistical significance of the results. A p of 0.1 represents significance at the 90% level, which is a common level of statistical significance desired by such tests. Based on this test, statistically significant differences can be claimed for two of the four pair wise comparisons shown in Figure 6-1.

- Under the private provision cases, collective payments elicit a higher WTP than voluntary payments at a significance level of p = 0.009 (significance of over 99%).
- Under the collective payment cases, private provision elicits a higher WTP than government provision at a significance level of p = 0.015 (significance of 98.5%).

The other two pair wise comparisons show data that are supportive of these conclusions – collective payment elicits a slightly higher WTP than voluntary, and private provision elicits a slightly higher WTP than government – but statistical significance cannot be claimed (p= 0.78 and 0.41). In fact, it should be noted that only Scenario 4 – collective payment, private provision – appears to elicit a substantially different WTP than the other scenarios, and even here the impact is largely restricted to one payment level: 50¢/month.

$$\sum_{i=1}^{n_A}\left(y_i \ln\theta_A + (1-y_i)\ln(1-\theta_A)\right) + \sum_{i=1}^{n_B}\left(y_i \ln\theta_B + (1-y_i)\ln(1-\theta_B)\right)$$

This is simply the sum of the log-likelihood functions for each sub-sample. The test is then a simple likelihood ratio test, and can be compared to a chi-squared random variable with 1 degree of freedom. Because our respondents are randomly assigned each to a single bid point, this approach easily generalizes to multiple bid points. I assume that each bid point has its own binomial parameter θ_{Bid}. The log-likelihood for multiple bid points is therefore the sum of the log-likelihoods for each bid point. With three bid points this can be compared to a chi-square random variable with 3 degrees of freedom.

This latter conclusion is confirmed by statistical analysis of the difference in proportions between each of the bid-point pairs. Here, instead of comparing the statistical difference between each of the WTP "curves" as was done previously, I compare results at each bid point in the graphs embedded in Figure 6-1. The statistical test used here is a simple 2-sample z-test for difference in proportions, and the results are presented in Tables 6-6 and 6-7.

Table 6-6. Difference in Proportions Tests: Collective vs. Voluntary

	Government Provision: Collective vs. Voluntary	Private Provision: Collective vs. Voluntary
50¢/month	z = 0.88	z = 3.34
	p = 0.38	p = 0.00
$3/month	z = 0.35	z = 0.43
	p = 0.72	p = 0.67
$8/month	z = 0.43	z =0.34
	p = 0.67	p = 0.74

Table 6-7. Difference in Proportions Tests: Government vs. Private

	Collective Payment: Government vs. Private	Voluntary Payment: Government vs. Private
50¢/month	z = 2.80	z = 0.26
	p = 0.00	p = 0.79
$3/month	z = 1.51	z = 1.58
	p =0.13	p = 0.11
$8/month	z = 0.48	z = 0.55
	p = 0.64	p = 0.58

As shown, under government provision, whether payments are collective or voluntary has no statistically significant impact on WTP responses at any of the bid points (p ranges from 0.38 to 0.72). Under private provision, however, a statistically significant difference in WTP response is found, but only at the 50¢/month level (p = 0.00). Similarly, with voluntary payments, WTP responses do not differ at the 90% significance level among government and private provision scenarios at any of the bid points (p ranges from 0.11 to 0.58). With collective payments, a statistically significant difference in WTP responses is found at the 50¢/month level ($p = 0.00$) and almost at the $3/month payment level ($p = 0.13$).

I am therefore forced to conclude that variations in payment methods and provision arrangements do appear to elicit some variation in respondents' WTP, but that the magnitude of this effect is relatively small in many cases and not as statistically persuasive as one might expect.

6.5.2 Response Certainty by CV Valuation Scenario

The valuation question was followed with a question to gauge the certainty of the respondent in their willingness to pay for renewable energy. This question was asked of only those respondents who had expressed a WTP for renewable energy in the previous valuation question. Though the specific question wording varied slightly by CV scenario, as an example, Scenario 1 respondents who received the $3 bid level were asked:

> *We know that some people are more certain than others about their answers. On a scale of 1 to 5, where 1 means "very uncertain" and 5 means "very certain," how certain are you that your household would support the adoption of this required $3 monthly surcharge?*

Responses to this question provide another test of systematic response differences based on payment method and provision arrangement. For example, it is conceivable that respondent certainty would be more sensitive to payment and provision effects than are yes/no CV valuation questions. This might even be expected if one believes that responses to CV valuation questions are affected by the expressive desires of the survey participants, and are therefore more reflective of general support for a cause than of monetary commitments per se (this argument is consistent with the theories put forth by many psychologists and other critics of CV, see, e.g., Hausman 1993, Green et al. 1994). In this instance, one might expect the CV valuation question to be insensitive to context, while responses to the certainty question may pick up these context effects.

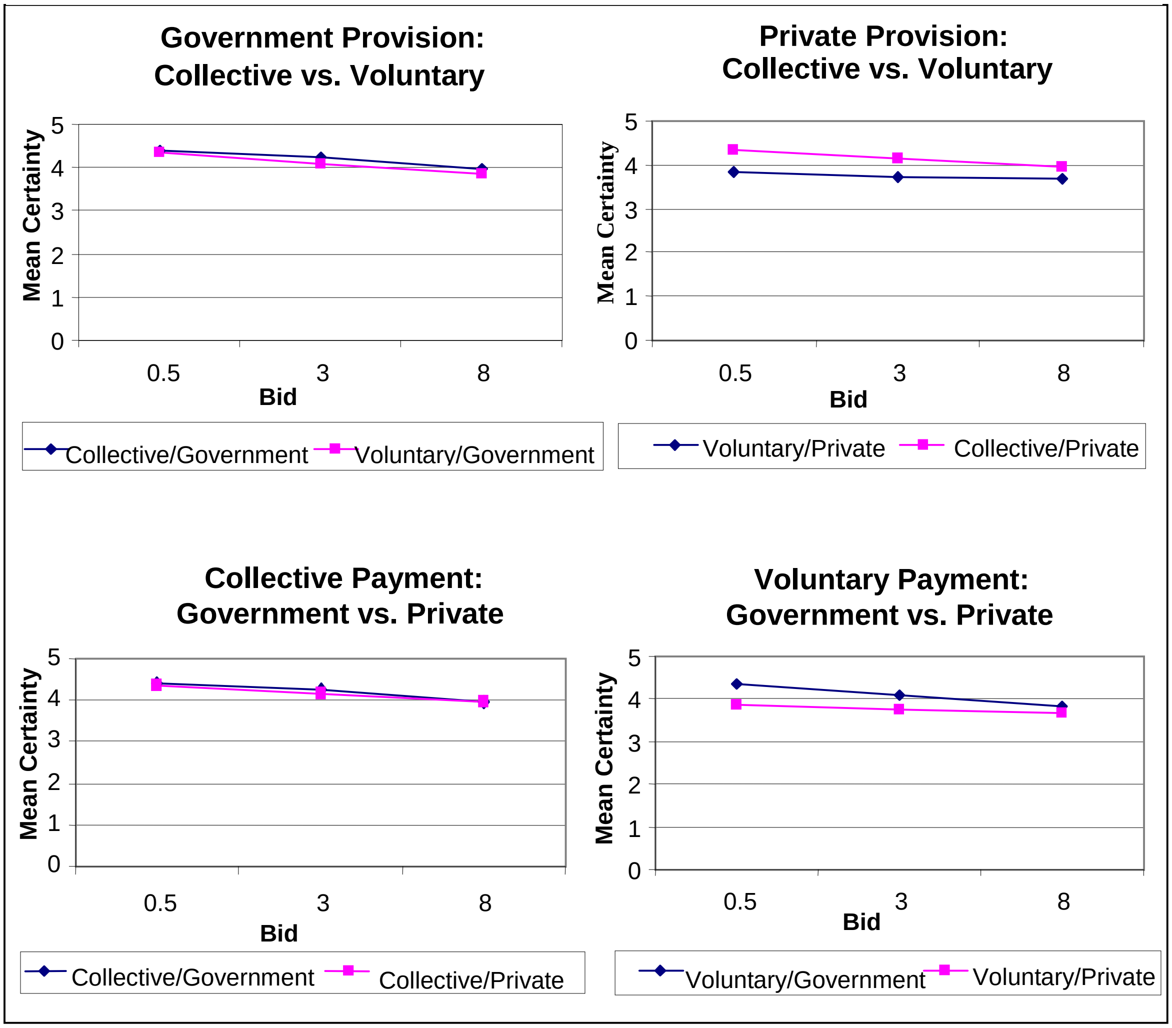
Table 6-8 summarizes the survey results for this question for the 4 CV valuation scenarios at each payment level. Figure 6-2 shows the important pair wise comparisons among the scenarios, illustrating the separable effects of payment method (voluntary vs. collective) and provision arrangement (government vs. private).

Table 6-8. Mean Response Certainty by Scenario and Bid

CV Scenario		**Bid Amount**	
	50¢ /month	$3/month	$8/month
Scenario 1: Collective Payment, Government Provision	4.39	4.25	3.98
Scenario 2: Voluntary Payment, Government Provision	4.34	4.10	3.84
Scenario 3: Voluntary Payment, Private Provision	3.85	3.74	3.68
Scenario 4: Collective Payment, Private Provision	4.35	4.14	3.97

The first thing to note from these results is that respondents express a high level of certainty in their responses overall. Moreover, as one might expect, certainty levels drop somewhat as the premium increases; this is true for all CV scenarios. This should be of some concern to CV proponents because it implies that respondent's are less certain of their WTP at high bid levels. This result supports the well-known "yea saying" effect common in dichotomous choice surveys: some respondents may be saying that they are willing to pay at high bid levels, when in fact they would be unwilling to support the requested premium if the question were not hypothetical. Such a response pattern may well have the effect of positively skewing aggregate and mean willingness to pay estimates, though it should be noted that the drop in certainty with higher payment levels is not dramatic.

Figure 6-2. Certainty Responses by Scenario and Bid Level



Of more importance to the study at hand is the fact that more certainty is expressed in some CV scenarios than others. Positive WTP responses to Scenario 3 – voluntary payment, private provision – in particular are clearly more *uncertain* than those for other scenarios. If anything, this suggests that the WTP data presented in Section

6.5.1 may be biased upwards for this scenario relative to other scenarios. If this is the case, an even stronger argument could be made for a lower WTP estimate under this scenario than under other scenarios. The data therefore seem to provide weak support for the conclusions that: (1) respondents are more certain about their WTP under the collective payment method than under voluntary payment, and (2) respondents are more certain of their WTP under government provision than under private provision.

As with the valuation results, however, these impacts appear largely restricted to one CV scenario – voluntary payment, private provision. This result is confirmed statistically in Tables 6-9 and 6-10, where a 2-sample t-test for differences in means is performed for each of the bid-point pairs in Figure 6-2 (this analysis follows the same basic structure as that presented in Tables 6-6 and 6-7 earlier, and assumes equal variances). As shown below, statistical differences in mean certainty levels are only found when Scenarios 2 (voluntary payment, government provision) and 4 (collective payment, private provision) are compared to Scenario 3 (voluntary payment, private provision); this can be seen in the low "p" values in the rightmost column in Tables 6-9 and 6-10, and the high "p" values in the left columns.

Table 6-9. Difference in Means Tests: Collective vs. Voluntary Certainty

	Government Provision: Collective vs. Voluntary	Private Provision: Collective vs. Voluntary
50¢/month	t = 0.30 p = 0.77	t = 3.08 p = 0.00
$3/month	t = 0.88 p = 0.39	t = 2.47 p = 0.01
$8/month	t = 0.78 p = 0.44	t = 1.64 p = 0.10

Table 6-10. Difference in Means Tests: Government vs. Private Certainty

	Collective Payment: Government vs. Private	Voluntary Payment: Government vs. Private
50¢/month	t = 0.29 p = 0.77	t = 2.78 p = 0.01
$3/month	t = 0.61 p =0.54	t = 2.18 p = 0.03
$8/month	t = 0.07 p = 0.94	t = 0.95 p = 0.35

Moreover, the fact that Scenario 3 (unlike all other scenarios) involves customer switching to a new electricity provider confounds interpretation of these results; it may be that the inclusion of customer switching in this scenario fully explains the differential certainty responses. Strong conclusions are therefore not possible. In fact, it should be noted that response sensitivity to payment and provision context appears as significant in the CV valuation question as in the certainty question; this latter finding is somewhat supportive of the CV method and is at odds with the tentative "psychological" theory for CV responses discussed earlier**.**

6.5.3 Analysis of "No" Responses

As is common in CV surveys, after the valuation question those respondents who indicated they were unwilling to pay for renewable energy at the specified premium were asked to identify why. The detailed wording of the question varies slightly by CV scenario; as an example, Scenario 1 respondents received the following question:

> *There are many reasons why households may not be willing to support the adoption of this required surcharge. Of the possible reasons listed below, please circle all that apply to you and your household.*

The possible response categories also differ slightly by CV scenario. Table 6-11 lists the response categories by scenario and summarizes the responses received.

Table 6-11. Reasons for Not Being Willing to Pay the Specified Premium

Possible Reasons for a "No" Response	Sc.1	Sc.2	Sc.3	Sc.4
My household can't afford to pay this much for renewable energy	31.8%	28.0%	27.0%	37.4%
The benefits of renewable energy aren't great enough to warrant the surcharge	46.8%	42.0%	12.9%	41.5%
Renewable energy should be supported, but I think households should be able to voluntarily pay for renewable energy and that it shouldn't be required [SCENARIOS 1 AND 4]	39.9%	na	na	44.9%
Renewable energy should be supported, but I think all households should be required to pay and that it shouldn't be voluntary [SCENARIOS 2 AND 3]	na	32.6%	31.5%	na
Renewable energy should be supported, but I wouldn't trust the government to effectively spend the funds collected by the surcharge [SCENARIOS 1 AND 2]	35.8%	39.4%	na	na
Renewable energy should be supported, but I wouldn't trust the private company to effectively spend the funds collected by the surcharge [SCENARIO 3]	na	na	40.5%	na
Renewable energy should be supported, but I wouldn't trust electricity suppliers and/or private companies to effectively spend the funds collected by the surcharge [SCENARIO 4]	na	na	na	27.2%
I am opposed to all new government programs	21.4%	21.2%	32.0%	24.5%
I object to these types of questions	13.3%	14.0%	7.3%	19.1%
I would need more information before making a decision	26.0%	23.9%	61.2%	29.3%
I wouldn't want to switch electricity providers for other reasons [SCENARIO 3]	na	na	24.3%	na
Other	16.8%	10.9%	8.4%	19.1%

Some of the most common reasons for a "no" response are very reasonable, for example, that the benefits are not great enough to warrant the surcharge and that the household cannot afford to pay the premium. Also significant is that, in the two voluntary payment scenarios, 32.6% and 31.5% of respondents say that all households should be required to pay. Similarly, in the two collective payment scenarios, 39.9% and 44.9% of respondents indicated that payments should be voluntary. A certain amount of distrust in the provision approach – whether government or private – was also identified as a reason for saying "no" to the valuation question. For those receiving a CV scenario with government provision, 35.8% and 39.4% indicated that they would not trust the government to effectively spend the funds. At the same time, for those receiving the private provision scenarios, 40.5% and 27.2% said that they would not trust the private company. Notice, however, that distrust in the private company is greater under the voluntary payment approach than the collective payment approach. Other common responses include a need for more information before making a decision, an opposition to all new governmental programs, and concern over switching electricity providers in Scenario 3 – voluntary payment, private provision. Less common responses include outright objection to CV questions or "other" write-in comments.

Only one aspect of the response to this question is particularly puzzling. Under Scenario 3 – voluntary payment, private provision – a disproportionately large number of respondents indicate that they would need more information before making a decision, while a disproportionately small number indicate that the benefits of renewable energy are not worth the premium. Why responses to Scenario 3 vary so much compared to the other scenarios is unknown. One possible explanation is that Scenario 3 was the only one to involve switching electricity suppliers. This may explain the heightened need for more information, but it does little to explain the relative lack of concern in Scenario 3 about the benefits of renewable energy not being worth the premium.

6.5.4 Participation Expectations: Will Others be Willing to Pay?

Also explored in the survey were the expectations of the survey respondents about the willingness to pay of other U.S. residents. That is, do respondents who state a WTP for renewable energy themselves predict that more people will join them in being willing to pay than do those respondents who say they are unwilling to pay the premium? And is this relationship stronger among some payment and provision contexts than others?

Such an effect has been found in numerous other academic disciplines. Some of the relevant literature, which the spans sociology, marketing, economics, and collective action fields, is reviewed in Section 6.8. Related concepts described in this literature include interpersonal influence, reciprocity, trust in others, and bandwagon effects. One underlying conclusion from much of this work is that human decision-making is often far more complex and socially determined than economic analysis assumes. Of perhaps the most direct relevance to the approach taken in this chapter are the conclusions of Dawes, McTavish and Shaklee (1977) and Orbell and Dawes (1991). These authors find that, in experimental settings, contributors to public goods expect significantly more cooperation than do defectors. That is, contributors to public goods expect a greater number of other individuals to also contribute than do those who are unwilling to contribute themselves. A related study by Pieters et al. (1998) shows that the expected pro-environmental behavior of other households is directly correlated with individuals' own environmental behaviors.

In the present study, I test for these effects in a hypothetical contingent valuation setting. While discussion of "participation expectations" and "interpersonal influence" is common in other disciplines, these effects have not been thoroughly tested in CV research, where a narrow focus on economic motivations that assume rational maximizing behavior and independent choices often pervades research agendas. Specifically, each CV survey asked what percent of U.S. residents the respondent believes would support and be willing to pay the specified premium for renewable energy. Though the exact question wording varies somewhat by CV scenario, for Scenario 1 the question reads:

> *Remembering that all homes and businesses in the United States would have to pay the same amount if this policy was adopted, what percent of all U.S. residents do you believe would support the adoption of this required $3 monthly surcharge.*

Ten response categories were allowed: less than 10%, 10-20%…90-100%.

Not only do answers to this question allow one to evaluate the relationship between stated willingness to pay and expectations for the willingness to pay of others, but they also allow one to assess how survey respondents believe others would respond to different payment or provision contexts. Do the same comparative preferences for collective over voluntary payment, and private over governmental provision, hold here? Additionally, do people believe they are more public spirited, i.e. more willing to pay for renewable energy, than other U.S. residents?

Table 6-12 shows the mean results for this question by bid, scenario, and response to the valuation question. For example, under Scenario 1 at the 50¢/month payment level, survey respondents indicated that (on average) they believed that 52.9% of other U.S. residents would be willing to pay for renewable energy through collective payments, with government provision of the good. Those respondents who indicated a willingness to pay themselves thought that 62.1% of other U.S. residents would also be willing to pay; those who indicated that they were not WTP thought that only 37.9% of other U.S. residents would be willing to pay.

Table 6-12. Expectations of the WTP of Others by Scenario and Bid

CV Scenario	**Response to Valuation Question**	**Bid Amount** 50¢ /month	$3/month	$8/month
Scenario 1: Collective Payment, Government Provision	Yes	62.1%	50.6%	49.5%
	No	37.9%	23.5%	30.7%
	Overall	52.9%	37.4%	38.7%
Scenario 2: Voluntary Payment, Government Provision	Yes	49.3%	42.9%	36.3%
	No	31.7%	23.2%	23.4%
	Overall	41.5%	32.8%	29.2%
Scenario 3: Voluntary Payment, Private Provision	Yes	49.5%	37.1%	39.8%
	No	28.4%	22.2%	25.4%
	Overall	40.7%	31.0%	31.9%
Scenario 4: Collective Payment, Private Provision	Yes	59.1%	50.3%	46.8%
	No	29.6%	28.3%	26.9%
	Overall	52.4%	42.0%	36.6%

As shown, the expected WTP among others declines as bid levels increase. This much is to be expected. Several important tentative conclusions also emerge from these data:

- **Payment Method Affects WTP Expectations.** As with the direct valuation question reported earlier, a greater willingness to pay is expected under collective payment methods than under voluntary payment. This is true under both the government and private provision arrangements, and can be seen best by looking at the overall response rows in Table 6-12. The differences also appear more substantial across all bid levels than the differences reported earlier for the direct valuation question. On average, collective WTP is expected to be approximately 25% higher than voluntary WTP. On the other hand, unlike the CV valuation question, no significant differences can be seen in response based on the provision arrangement. Overall, these results show that the WTP expectations of others are sensitive to payment method, with a higher WTP expected under collective than under voluntary payment, but that a similar sensitivity is not detected for provision arrangement effects. Survey respondents seemingly understand the nature of the free-riding effect: respondents expect more U.S. residents to support a collective payment approach for renewable energy than a voluntary one.

- **Individuals Who are Willing to Pay Often Expect Others to Reciprocate.** The WTP expectations for others is far lower among those who are not willing to pay for renewable energy themselves than it is for those who are willing to pay. The differences are striking. Those who indicate a willingness to pay for renewable energy often expect twice as many people to do likewise than do those who indicate they are not willing to pay. For example, under collective payment and private provision at the 50¢/month payment level, those who state a WTP also indicate that they believe 59.1% of other U.S. residents would be willing to pay; this percentage drops to 29.6% for those who state that they themselves would not be willing to pay. Moreover, this basic result is true in all four payment and provision scenarios. Apparently, regardless of the payment and provision method, those who indicate a willingness to pay for renewable energy also believe that many others will reciprocate and be willing to pay. This finding is consistent with the conclusions reported earlier by Dawes, McTavish and Shaklee (1977), Orbell and Dawes (1991), and Pieters et al. (1998).

It is also important to note what this finding *does not* directly tell us. Specifically, a number of academic disciplines (briefly reviewed in Section 6.8) have reported on a "bandwagon" or "reciprocity" effect: that is, the participation of others in an activity directly increases the probability that still more individuals will participate. Contributions are matched with more contributions, while defection is matched with defection. In this way, initial contributions can trigger a chain reaction of additional contributions when a "critical mass" of participants is achieved. Among several possible reasons for this effect is that individuals will only contribute towards public goods themselves if they believe that others are doing their fair share.

The results presented here are suggestive of such an effect, and are consistent with much of the extant literature in this area, but tell us little about causality. Specifically, results presented so far show a positive correlation between "participation expectations" and stated WTP, but cannot directly tell us whether (1) it is because others are expected to contribute that survey respondents also indicate a WTP (the "bandwagon" or "reciprocity" effect), or (2) whether respondents who say they are WTP simply "defend" their choice by saying that they believe that others would make a similar one. Results also tell us little about the cause of the effect. These issues are addressed in more detail in Section 6.8, a section that also highlights the need for additional research to more fully understand the findings reported here.

- **Respondents Perceive Themselves to be More Willing to Pay than Others.** How do these responses compare to actual stated WTP as expressed in the earlier valuation question? Using overall responses from Table 6-12, it is clear that respondents' perceptions of the WTP of others is lower than their own stated willingness to pay. For example, at the $3 bid level of Scenario 1, 50% of respondents indicated that they were willing to pay in the valuation question, while survey respondents believed that just 37.4% of U.S. residents would support the same surcharge. A similar effect is found for all other CV scenarios and bid points. This effect remains generally true, but not as decisively, if one focuses only on the responses of those who do express a willingness to pay for renewable energy (it appears true in all cases except Scenario 1). Apparently, respondents to this survey in general feel that they are more likely to be willing to pay for renewable energy than are others. This is consistent with other research findings that show that individuals attribute higher levels of pro-environmental behavior to themselves than to others, perhaps out of a motivation to hold positive beliefs about themselves and maintain self-esteem (Pieters et al. 1998).

6.5.5 Multivariate Regression Analysis: Simple Pair Wise Comparison Models

One of my objectives in this study is to explain observed differences in willingness to pay among respondents based on a number of possible explanatory variables. Regression analysis can be used for this purpose. It provides a further test for systematic differences among valuation responses based on payment and provision contexts. It also provides a more robust method of testing for the "participation expectation" effects discussed in the previous section, and for evaluating the impact of demographic, socioeconomic, and attitudinal variables on stated willingness to pay for renewable energy.

This parametric logit analysis is performed in a fashion that is typical in contingent valuation studies (see, e.g., Hanemann and Kanninen 1999). Mathematically, one can write the probability of observing a "yes" response to the valuation question, where WTP is distributed with mean μ and variance σ, as equal to:

$$\Pr\{response\ is\ 'yes'\} = 1 - G_\eta(\frac{Bid}{\sigma} - \frac{\mu}{\sigma}).$$

In this case G_η is chosen to be the cumulative distribution function for the stochastic component η.

To introduce demographic, socioeconomic, and other characteristics, it is assumed that for individual "i" who is faced with a given bid level one can rewrite the individual specific mean as $\mu_i = X_i\beta$ such that:

$$\Pr\{response\ is\ 'yes'\ for\ individual\ i\} = 1 - G_\eta(\frac{Bid_i}{\sigma} - \frac{X_i\beta}{\sigma}).$$

This allows one to incorporate demographic, socioeconomic, and other effects (represented by *X∃*) into an analysis of WTP using standard logit analysis, and to do so in a utility-theoretic fashion.

Perhaps the simplest method of testing for the impact of payment method and provision arrangement on responses to the valuation question is to consider pair wise comparisons between the different valuation scenarios, much as was done earlier with summary statistics. Using this approach, the dependent variable in the logit equation is whether or not the respondent said "yes" to the valuation question (1=yes; 0=no). Including a dummy "treatment" variable (which indicates whether payment was voluntary or collective, or whether provision was through the government or the private sector) as an independent explanatory variable allows one to see whether the treatment has a significant positive or negative effect on the probability of being willing to pay for renewable energy. Other socioeconomic and demographic variables are also included as independent explanatory variables. Here I keep the model simple, and do not include attitudinal or "participation expectation" variables; that is done in the subsequent section. Table 6-13 shows the independent variables used in the simple logit analysis that follows and the fuller model presented later.

Table 6-13. Model Variables

Variable	Description
Bid	$0.5, $3, or $8 depending on survey version
Payment and Provision Dummy Variables	
Voluntary Payment	1 if voluntary payment; 0 if collective payment
Private Provision	1 if private provision; 0 if government provision
Demographic and Socioeconomic Variables	
Rent	1 if rent; 0 if home ownership
Age	1-7 age scale
Female	1 if female; 0 if male
Children	1 if have children; 0 otherwise
Liberalism	1-5 scale; 1=very conservative, 5=very liberal
Education	1-8 education scale
Income	1-12 household income scale
Attitudinal Questions: 1-5 agreement scales; 1=strongly disagree, 5=strongly agree	
First Mover	“I am often one of the first people I know to try new products”
Little One Can Do	“There is not much that any one individual can do about the environment”
Affected by Others	“I am more likely to buy environmentally friendly products if I know that other people are doing the same”
Company Distrust	“I don’t trust the environmental claims of companies offering environmentally friendly products”
Distrust of Others	“I don’t trust other people to make personal sacrifices to protect the environment”
No Regulations	“Now that companies are offering environmentally friendly products, we don’t need as many environmental regulations”
Government Distrust	“The government can’t be trusted to collect funds and spend them on worthwhile causes”
All Should Pay	“The government should require everyone to help pay for environmental improvements”
Direct Benefits	“I will only pay more for environmentally friendly products if I receive a direct benefit from doing so”
Family Support	“I think my family and friends would support renewable energy if they had the option”
Other Questions	
Participation Expect.	1-10 scale on perceived likelihood that others would be willing to pay
Environ. Actions	Number of environmental actions done by household on regular basis from list of 11 possibilities (see Question 14)

Table 6-14 shows the results of the four pair wise regression analyses, and presents coefficient estimates with standard errors (in parenthesis) and probabilities (indicated by asterisks). Each of the four pair wise regression equations equates to one of the graphs shown earlier in Figure 6-1: the first column in the table analyzes responses to Scenarios 1 & 2, the second column Scenarios 3 & 4, the third column Scenarios 2 & 3, and the fourth column Scenarios 1 & 4.

Table 6-14. Logit Equations for Pair Wise Comparisons

Variable	**Collective vs. Voluntary Payment**		**Government vs. Private Provision**	
	Government Provision *coefficient* *(s.e.)*	Private Provision *coefficient* *(s.e.)*	Voluntary Payment *coefficient* *(s.e.)*	Collective Payment *coefficient* *(s.e.)*
Bid	-0.097*** (-0.025)	-0.147*** (0.027)	-0.091*** (0.026)	-0.149*** (0.026)
Rent	-0.204 (0.223)	0.261 (0.249)	0.086 (0.230)	-0.098 (0.236)
Age	-0.081 (0.063)	-0.097 (0.063)	-0.097 (0.061)	-0.093 (0.064)
Female	0.448*** (0.177)	-0.024 (0.178)	-0.042 (0.171)	0.485*** (0.186)
Children	0.054 (0.215)	-0.468** (0.221)	-0.037 (0.209)	-0.389* (0.224)
Liberalism	0.316*** (0.084)	0.229*** (0.086)	0.303*** (0.083)	0.233*** (0.086)
Education	0.000 (0.058)	0.115** (0.058)	0.059 (0.057)	0.062 (0.060)
Income	0.117*** (0.031)	0.089*** (0.032)	0.092*** (0.031)	0.108*** (0.033)
Private Provision	na	na	0.200 (0.159)	0.505*** (0.167)
Voluntary Payment	-0.139 (0.161)	-0.451*** (0.165)	na	na
Constant	-0.819 (0.575)	0.226 (0.561)	-0.874 (0.553)	-0.296 (0.583)
# of Observations	*682*	*698*	*694*	*686*
Log Likelihood	*-442.5*	*-429.0*	*-454.3*	*-421.2*
LR Test	*59.46*	*85.95*	*52.10*	*86.06*
p-value	*0.00*	*0.00*	*0.00*	*0.00*
% Correct Predictions	*62.3%*	*65.6%*	*59.2%*	*66.6%*

*, **, *** denote significance at the 10%, 5% and 1% level

As shown in each regression, the “bid” variable is negative and highly statistically significant; the probability of saying “yes” to the valuation questions clearly declines as bid levels increase. The same conclusion was reached earlier, but here I am able to make the claim with clear statistical significance.

The regression results are also consistent with the findings presented earlier on the impacts of payment method and provision arrangement. The negative coefficient on “voluntary payment” in the first two columns in Table 6-14 shows that collective payments elicit a higher WTP than voluntary ones under both the private (column 2) and government (column 1) provision scenarios, though only the coefficient in the private provision case is statistically significant. Similarly, the positive coefficient on the “private provision” variable in the latter two columns in Table 6-14 shows that private provision elicits a higher WTP than government provision, though only the coefficient in the collective provision case is highly significant. The interpretation of these results is the same as that offered earlier: a higher WTP appears to be elicited with collective payment and private provision than voluntary payment and government provision, but statistical significance can only be claimed in two of the four pair wise comparisons.

As for the demographic and socioeconomic variables, some consistent impacts are found. In particular, coefficients on the income and liberalism variables are consistently positive and are statistically significant in all four regressions. Households with higher incomes and respondents who are more liberal are found be to be more likely to say “yes” to the valuation question. Being female also appears to increase the probability of being willing to pay for renewable energy, but this effect is only apparent and statistically significant in two of the four regressions. Respondents with children appear less willing to pay for renewable energy than those without children, though again this effect is only significant in two of the four pair wise comparisons. Finally, though statistical significance is limited, increased age appears to reduce WTP and education appears to increase WTP; home ownership has no consistent effect.[66]

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[66] Two other approaches that can be used to test for payment and provision effects deserve mention.

Option 1: One option is to pool all of the survey data and simply use three dummy variables to capture the effects of all four payment and provision scenarios. The advantage of this approach comes in its larger sample size. The disadvantages are that it assumes that socioeconomic, demographic, and bid variables have similar effects on WTP for all payment and provision scenarios, and that it does not allow for a unique separation of payment effects and provision effects. Results from a regression of this type are provided in the following table in the left column. In this case, Scenario 1, 3, and 4 are the dummy variables that indicate the payment and provision scenario; Scenario 2 is the base-case, so does not require a dummy variable.

Option 2: Another regression option is to again pool all of the survey data, and to use two dummy variables, one that captures whether payment is voluntary (1) or collective (0), and another that captures whether provision is through the government (0) or the private sector (1). The advantages of this approach are that it also allows a pooling of all the data (a higher "n"), and in additional allows for a separation of payment and provision effects. Unfortunately, this approach results in a loss of information because it assumes that, for example, the impact of voluntary payment is equal under both government and private provision. This regression is also reported below, this time in the rightmost column.

Variable	**Option 1: Coefficient (s.e.)**	**Option 2: Coefficient (s.e.)**
Bid	-0.119 (0.018)***	-0.119 (0.018)***
Rent	-0.005 (0.164)	0.002 (0.163)
Age	-0.098 (0.044)**	-0.097 (0.044)**
Female	0.201 (0.125)	0.191 (0.124)
Children	-0.201 (0.152)	-0.206 (0.152)
Liberalism	0.272 (0.057)***	0.272 (0.060)***
Education	0.062 (0.041)	0.063 (0.041)
Income	0.097 (0.022)***	0.097 (0.022)***
Scenario 1 Dummy	0.179 (0.161)	na
Scenario 3 Dummy	0.193 (0.159)	na
Scenario 4 Dummy	0.661 (0.162)***	na
Private Provision Dummy	na	0.333 (0.114)***
Voluntary Payment Dummy	na	-0.322 (0.114)***
Constant	-0.658 (0.408)	-0.404 (0.402)
Number of Observations	*1380*	*1380*
Log Likelihood	*-879.2*	*-880.3*
LR Test	*136.9*	*135.3*
p-value	*0.00*	*0.00*
% Correct Predictions	*62%*	*62%*

*, **, *** denote significance at the 10%, 5% and 1% level

6.5.6 Multivariate Regression Analysis: A More Complex Model

A more complex regression model, incorporating both the attitudinal and "participation expectation" variables listed in Table 6-13, is described in this section. Rather than proceeding with pair wise comparisons, however, here four distinct logit models are estimated, one for each of the four payment and provision scenarios. The goal is to evaluate the impacts of various socioeconomic, demographic, and attitudinal factors – including "participation expectation" – on the probability of a "yes" response to the valuation question, and to do this across different CV scenarios. The pooled scenario responses used earlier are inappropriate to meet this objective because each of the pooled scenarios (i.e., each column in Table 6-14) includes responses to two of the CV scenarios. Here, each specific CV scenario is analyzed separately. This does not allow one to evaluate the impact of payment and provision arrangements on WTP (which was the purpose of the pooling, earlier), but does allow for a more complete analysis of the impact of socioeconomic, demographic, and attitudinal variables on WTP. Because I do not pool scenario responses in this analysis, however, the sample size for each regression is significantly reduced. Statistical power is therefore also lower, and only variables that have substantial impacts on the results are likely to be found statistically significant. Table 6-15 shows the results of the logit analysis in the same format as provided in the previous analysis.

The results from these regressions are consistent with those found earlier. Bid, age, liberalism, and income variables all have statistically significant impacts of the WTP results. As shown with Option 1, Scenario 2 captures the lowest WTP, but only WTP under Scenario 4 is higher in a statistically significant way. Meanwhile, Option 2 shows that private provision increases WTP in the pooled regression, while voluntary payment decrease WTP. The regression does not allow one to discriminate this effect across different provision arrangements, however, as does the approach used in the main body of this chapter that looks at pair-wise comparisons.

Table 6-15. Logit Equations for Independent Sample Results

Variable	**Treatment**			
	Scenario 1: Coll/Gov't *coefficient* *(s.e.)*	Scenario 2: Vol/Gov't *coefficient* *(s.e.)*	Scenario 3: Vol/Pvt *coefficient* *(s.e.)*	Scenario 4: Coll/Pvt *coefficient* *(s.e.)*
Bid	-0.17*** (0.06)	-0.03 (0.05)	-0.08* (0.05)	-0.23*** (0.06)
Rent	-1.01** (0.47)	-0.72* (0.39)	0.31 (0.43)	0.33 (0.49)
Age	-0.08 (0.13)	-0.18 (0.12)	-0.20* (0.12)	-0.26* (0.14)
Female	0.90** (0.38)	0.15 (0.33)	-0.20 (0.31)	0.52 (0.44))
Children	-0.05 (0.46)	0.32 (0.37)	-0.43 (0.38)	-0.43 (0.50)
Liberalism	-0.03 (0.18)	0.08 (0.16)	0.11 (0.16)	-0.29 (0.19)
Education	0.03 (0.13)	-0.06 (0.11)	0.26** (0.11)	-0.04 (0.13)
Income	0.08 (0.07)	0.12** (0.06)	0.06 (0.06)	0.10 (0.08)
First Mover	0.04 (0.18)	0.19 (0.15)	0.35** (0.15)	-0.14 (0.17))
Little One Can Do	-0.24* (0.14)	-0.04 (0.12)	-0.03 (0.13)	0.07 (0.16)
Affected by Others	0.11 (0.14)	0.27* (0.14)	0.09 (0.14)	0.31** (0.17)
Company Distrust	-0.25 (0.19)	-0.01 (0.17)	-0.18 (0.18)	-0.15 (0.20)
Distrust of Others	0.22 (0.17)	0.14 (0.16)	-0.09 (0.17))	0.02 (0.17)
No Regulations	-0.05 (0.16)	-0.15 (0.14)	0.11 (0.16)	-0.22 (0.17)
Government Distrust	-0.43*** (0.15)	-0.27** (0.13)	-0.10 (0.13)	-0.34** (0.16)
All Should Pay	0.71*** (0.14)	0.25** (0.12)	0.27** (0.12)	0.41*** (0.15)
Direct Benefits	-0.01 (0.15)	-0.42*** (0.15)	-0.35*** (0.14)	-0.31* (0.16)
Family Support	0.62*** (0.19)	0.74*** (0.19)	0.59*** (0.21)	0.77*** (0.22)
Participation Expectations	0.48*** (0.09)	0.41*** (0.09)	0.61*** (0.10)	0.56*** (0.10))
Environ. Actions	0.21** (0.11)	0.07 (0.09)	-0.05 (0.09)	0.29*** (0.11)
Constant	-4.75*** (1.77)	-4.02*** (1.49)	-4.16** (1.63)	-1.50 1.89
Number of Observations	318	330	324	336
Log Likelihood	-121.0	-152.3	-152.1	-112.8
LR Test	196.4	152.6	141.77	212.5
p-value	0.00	0.0	0.00	0.00
% Correct Predictions	84.6%	78.5%	77.5%	84.9%

*, **, *** denote significance at the 10%, 5% and 1% level

Visual inspection of the results leads to a number of interesting and relevant conclusions:

- **Model Accuracy Improves:** Including attitudinal variables in addition to standard socioeconomic and demographic variables increases the predictive capabilities of the regression models substantially. Data presented earlier for the more restricted model runs that only included socioeconomic and demographic variables showed that those logit models accurately predicted respondents' "yes/no" valuation responses 59-67% of the time. The more complex models presented here that include attitudinal and other factors predict valuation responses accurately 77-85% of the time.[67] The importance and statistical

[67] This comparison is not perfect because the more restricted model was run using pair wise comparisons, while the more complete model was run on each valuation scenario separately. I therefore also ran the logit model on each valuation scenario separately, with attitudinal variables excluded. The results are presented in the following table, which show a prediction accuracy for these four runs that ranges from 59.8% to 70.7%. These results confirm the findings presented above.

Variable	**Treatment**			
	Scenario 1: Coll/Gov't *coefficient (s.e.)*	Scenario 2: Vol/Gov't *coefficient (s.e.)*	Scenario 3: Vol/Pvt *coefficient (s.e.)*	Scenario 4: Coll/Pvt *coefficient (s.e.)*
Bid	-0.112 (0.037)***	-0.086 (0.037)**	-0.099 (0.037)***	-0.194 (0.038)***
Rent	-0.259 (0.325)	-0.126 (0.313)	0.414 (0.354)	0.125 (0.359)
Age	-0.046 (0.089)	-0.120 (0.089)	-0.071 (0.085)	-0.125 (0.095)
Female	0.781 (0.257)***	0.145 (0.250)	-0.155 (0.239)	0.127 (0.275)
Children	-0.117 (0.319)	0.193 (0.294)	-0.291 (0.304)	-0.664 (0.328)**
Liberalism	0.326 (0.122)***	0.308 (0.118)***	0.296 (0.120)**	0.144 (0.125)
Education	0.045 (0.085)	-0.038 (0.081)	0.146 (0.081)*	0.062 (0.086)
Income	0.111 (0.044)**	0.124 (0.045)***	0.072 (0.043)*	0.120 (0.051)**
Constant	-1.163 (0.828)	-0.626 (0.797)	-0.919 (0.767)	1.03 (0.838)
# of Observations	334	348	346	352
Log Likelihood	-211.97	-228.15	-222.10	-203.68
LR Test	37.34	26.12	33.18	51.82
p-value	0.00	0.00	0.0	0.00
% Correct Predict.	66.5%	59.8%	62.1%	70.7%

*, **, *** denote significance at the 10%, 5% and 1% level

significance of attitudinal variables in this analysis is consistent with the results of other CV studies, which have also found that attitudinal variables often do a better job of predicting WTP response than do socioeconomic and demographic factors (Kotchen and Reiling 2000, Luzar and Cosse 1998). The relative importance of attitudinal variables over demographic and socioeconomic factors is also consistent with studies that have profiled the characteristics of "green" consumers (see, e.g., Roberts 1996).

- **"Participation Expectation" Effects are Substantial.** Data reported here confirm previous analysis that showed the importance of "participation expectations." Respondents who indicate they are willing to pay for renewable energy are far more likely to believe that large numbers of others will also contribute. Interestingly, this is true across all payment and provision scenarios (this is, again, consistent with the previous findings), and can be seen by the statistical significance of the "participation expectation" variable in all four of the regression runs presented in Table 6-15. The phenomenon is, again, substantial. As with the previous results, however, statistical techniques can test only for associations between variables, not for causation. Accordingly, the findings reported so far do not directly tell us whether (1) it is because others are expected to contribute that survey respondents also indicate a WTP (the "bandwagon" or "reciprocity" effect), or (2) whether respondents who say they are WTP simply defend their choice by saying that they believe that others would make a similar one. The results are therefore suggestive of the bandwagon/reciprocity effect, but are certainly not definitive.

- **Socioeconomic and Demographic Variables have a Modest Effect.** Once attitudinal variables are included in the model, the statistical significance of the socioeconomic and demographic variables decreases. Income remains positively related to a "yes" response to the valuation question, but statistical significance is only achieved in one of four model runs. Liberalism has no consistent or significant effect on the results, unlike in the previous models, presumably because other attitudinal factors are now capturing that impact. Home rental reduces WTP in two cases in a statistically significant fashion, but fails to do so in the other two scenarios. Age again appears to reduce the probability of a "yes" response to the valuation question, while being female increases that probability in three of four cases. The bid variable has a negative coefficient, as one would expect, an effect that is statistically significant in three of four cases.

- **Several Attitudinal Variables Have Significant Effects.** I find that some attitudinal variables have statistically significant effects on the probability of a "yes" response to the valuation question, while others do not. As noted by the NOAA panel report on the reliability and accuracy of CV (Arrow et al. 1993), including such attitudinal variables in a contingent valuation context can help test the construct validity of the CV method – that is, the degree to which stated WTP varies with other attitudinal measures in ways that are consistent with theory or common sense. The results of my regression runs do show a number of effects that appear consistent with construct validity. These results also shed additional light on why and when individuals might be willing to support renewable energy. For example:

- Those who believe that their family and friends would also support renewable energy ("family support") are more likely to be willing to pay themselves. This finding is highly significant across all four CV scenarios. This result is supportive of the "participation expectations" finding discussed earlier, and suggests that the influence of near peers (family and friends) is separate from the more general "participation expectations" result. Similarly, those who more strongly agreed with the statement "I am more likely to buy environmentally friendly products if I know that other people are doing the same" ("affected by others") were also more likely to be willing to pay for renewable energy, though this effect rises to statistical significance in only two of the four cases. While many questions about these results remain unanswered (see Section 6.8), this finding further illustrates the *possible* importance of the actions of others in one's own decision making.

- A belief that government should require everyone to pay for environmental improvements ("all should pay") is positively related to willingness to pay for renewable energy in all four scenarios, including those with collective *and* voluntary payments. Apparently, those who are willing to pay for renewable energy, regardless of the payment method, are also inclined to believe that everyone should be required to pay for environmental improvements. This finding is, however, more significant in the collective payment cases than in the voluntary cases, as one would expect (this can be seen by the magnitude of the coefficient in Scenarios 1 and 4 versus 2 and 3).

- Distrust of the government to effectively collect and spend funds ("government distrust") is negatively related to WTP in all four CV scenarios, and is statistically significant in three; those with a greater trust in the government are also more likely to say they would pay a premium for renewable energy. Also consistent with what one might expect, this effect is least significant in the scenario that involves the least amount of government intervention: voluntary payments and private provision.

- Survey participants who strongly agreed with the statement "I will only pay more for environmentally friendly products if I receive a direct benefit from doing so" ("direct benefits") were also less willing to pay for renewable energy than those who disagreed with this statement. This effect is statistically significant in three of four cases.

- Those respondents who strongly agreed with the statement "I am one of the first people I know to try new products" ("first mover") were significantly more likely to state a willingness to pay for renewable energy in the voluntary payment scenario with private provision. This effect is not significant in the other scenarios. This result is plausible because the voluntary payment/private provision scenario, which also involves switching to a new electricity supplier, is the closest of all scenarios to a new product purchase.

- A lack of trust in the claims of companies offering environmental products ("company distrust") reduces the probability of a "yes" response to the valuation question in all four scenarios, but is not statistically significant in any. A distrust of others to make personal sacrifices for the environment ("distrust of others") and a belief that environmental regulations will no longer be required with the advent of environmental marketing ("no regulations") have no discernable impacts on the WTP results. Meanwhile, a belief that there is little that any one individual can do about the environment ("little one can do") appears to have a limited but negative effect on WTP.[68]

- Finally, those respondents who indicated that their household undertakes a large number of environmental actions on a regular basis (e.g., recycling,

[68] This last result is at odds with research that has found a substantial relationship between "perceived consumer effectiveness" and environmental intentions and behaviors (see, e.g., Ellen et al. 1991, Berger and Corbin 1992, Roberts 1996)

purchasing organic foods, etc.) also appear more willing to pay for renewable energy, especially in the collective payment scenarios.

6.5.7 Opinion Survey Results

As an adjunct to the CV surveys, an opinion survey was fielded to a more limited sample of U.S. residents. An important goal of this survey was to provide a measuring stick for the CV results. A number of the warm-up, demographic, and socioeconomic questions in the opinion survey were the same as those in the CV surveys; results from these questions are not reported here. Instead, I focus on the questions included in the opinion survey that relate to the specific objectives of this chapter and that can be compared to the results of the CV study. As will be shown, responses to the opinion survey are largely consistent with the CV results, reported earlier. I also summarize answers to other questions that relate to the barriers, motivations, and preferences of individuals who might voluntarily purchase green power.

Support for Renewable Energy

After the same warm-up questions included in the CV survey, an initial question (Question 9) in the opinion survey asked simply:

> *Do you believe that renewable energy production should be increased, even if it costs more than other electricity production options?*

55% answered affirmatively, with the remaining 45% saying no (n = 199). This finding is somewhat surprising in that a relatively modest majority of individuals indicated support for renewable energy. While the somewhat tepid response may in part be caused by uncertainty as to the level of the cost impact, it is reasonable to conclude that support for renewable energy is not unqualified among the American populace.

Payment Preferences

To evaluate individual preferences for different payment methods – whether collective or voluntary - Question 10 continued:

> *If renewable energy is to be supported, the extra money needed to increase the supply of renewable energy could be collected in a number of ways. Of the two possible approached listed below, which one would you <u>most</u> prefer?*
>
> 1. *Option 1: The extra money could be raised through a <u>required</u> surcharge on the electricity bills of all homes and businesses in the United States.*
> 2. *Option 2: The extra money could be raised through a <u>voluntary</u> surcharge on the electricity bills of only those homes and businesses in the United States that volunteer to support renewable energy.*

Table 6-16 summarizes the overall response to this question and the response segmented by initial response to Question 9, above.

Table 6-16. Response to Payment Preferences Question

Payment Preference	**Overall Response**	**Response of Those Who Indicated Support for RE in Q9**	**Response of Those Who Indicated a Lack of Support for RE in Q9**
Required Surcharge	53%	70%	29%
Voluntary Surcharge	47%	30%	71%
Sample Size	*n=182*	*n = 106*	*n = 75*

Results are as one might expect. Those who initially indicated support for renewable energy generally favor collective payment methods, while those who do not wish to pay more for renewable energy typically prefer voluntary payments. In aggregate, a collective, required surcharge is marginally preferred to a voluntary surcharge.

When compared to the CV results, it is interesting to note that payment preferences are perhaps stronger and more apparent in the opinion survey. Specifically, in the CV survey a higher WTP for renewable energy is found for collective payment than for voluntary payment, but not by a large margin in many cases. While overall response to the opinion survey question above would appear to support this conclusion (just 53% prefer collective payment), the relevant comparison is not with the overall response, but rather with the response of those who supported renewable energy in Question 9; this is because it is only these individuals who would presumably answer affirmatively when faced with a CV question on WTP for renewable energy. With this basis for comparison, it is clear that among those who support renewable energy, the majority (70%) prefer collective payments to voluntary ones. This margin of difference is not replicated in the CV survey, where more modest WTP differences are found. This should not, however, be entirely surprising. While those who support renewable energy may strongly prefer a collective payment mechanism, this is not to say that they would be unwilling to pay when confronted with a voluntary choice.

The survey also asked why respondents selected the payment method that they did. For example, for those who expressed a preference for collective payments, the survey asked:

> *There are many possible reasons why individuals might prefer that all households and businesses be required to pay for renewable energy. Of the possible reasons listed below, please circle all that apply to you.*

The three response categories offered, and a summary of the results, are listed in Table 6-17.

Table 6-17. Reasons for Preferring Collective Payments

Response Category	% of Respondents Who Mentioned
Renewable energy benefits everyone so everyone should be required to pay (i.e., it shouldn't be voluntary)	68%
If everyone pays, the actual yearly cost of renewable energy could be lower	76%
I don't trust other people to voluntarily pay more for renewable energy	54%
Other	9%

Those who preferred voluntary payments were asked a similar question, with results presented in Table 6-18.

Table 6-18. Reasons for Preferring Voluntary Payments

Response Category	% of Respondents Who Mentioned
People shouldn't be required to pay for something they don't want	66%
Renewable energy just isn't that important to me	23%
I couldn't afford to pay more for renewable energy	55%
Voluntary action by individuals can go a long way towards improving the environment	47%
Other	8%

The most common reasons for preferring collective payments are to reduce overall costs on a per-customer basis and to ensure that everyone who benefits also pays. Concerns that others would not pay under a voluntary scheme were also common. Those who prefer voluntary payments note that people shouldn't be required to pay for something they do not desire, that the payment might be unaffordable, and that voluntary action can go a long ways towards improving the environment.

Provision Preferences

As with the CV surveys, the opinion survey also sought to understand preferences for different provision arrangements: governmental or private. Specifically, the survey asks:

> *Funds used to support renewable energy could be managed in many ways. Of the two possible approaches listed below, which one would you most prefer?*
>
> 1. *Option 1: Funds from an electricity bill surcharge could be collected by the government and used to help fund the construction of more renewable energy projects*
> 2. *Option 2: Funds from an electricity bill surcharge could be collected by each customers' electricity supplier and used by private companies that sell renewable energy to build more renewable energy projects*

Results are presented below in Table 6-19. Consistent with the CV results, private provision is marginally preferred to government provision. Unlike payment preferences, however, this holds regardless of whether the respondent did or did not initially indicate their support for renewable energy in Question 9.

Table 6-19. Response to Provision Preferences Question

Payment Preference	Overall Response	Response of Those Who Indicated Support for RE in Q9	Response of Those Who Indicated a Lack of Support for RE in Q9
Government Provision	46%	45%	47%
Private Provision	54%	55%	53%
Sample Size	*n= 179*	*n = 106*	*n = 72*

Other Questions: Crowding Out and Bandwagon Effects

The opinion survey contained a number of additional questions to better understand consumers' opinions about and demand for renewable energy in a voluntary green marketing context. Here I report the answers to some of these questions.

First, the survey asked:

> *Some households in the United States now have the option to voluntarily purchase renewable energy from their existing electric utility or from a new electricity supplier. With utility deregulation, new electricity suppliers in some states are marketing renewable energy. In states that have not deregulated their electricity industry, some electric utilities offer their customers the ability to pay a premium for renewable energy. Does your household have the option to voluntarily purchase renewable energy through one of these programs?*

8% of respondents answered affirmatively, 60% negatively, and 32% indicated that they did not know. Because approximately 40% of all U.S. households have one or more green power choice available to them (see Chapter 2), it appears that knowledge of existing green power programs among survey respondents is limited.

The survey goes on to ask a question similar to the CV valuation question in Scenario 3: voluntary payment, private provision. Specifically:

> *Would your household be willing to voluntarily purchase renewable energy from one of these types of programs if it cost an extra $3 on your monthly electricity bills?*

61% of respondents answered that they would be willing to pay, while 39% indicated that they would not. This compares favorably to the 57% who indicated they would be willing to pay under CV Scenario 3 at the $3/month bid level.

For those who indicated a willingness to pay, I sought to understand whether “crowding out” could be a concern. Crowding-out refers to the possibility that increased funding for social causes by the government will reduce private, voluntary contributions to those same causes. Public goods theory predicts that this will be the case (Steinberg 1987, Cornes and Sandler 1986), and there is some empirical evidence to support the crowding out effect in other contexts (Brooks 2000); other empirical evidence shows the opposite effect (Richer 1995). To question this hypothesis with respect to renewable energy, the survey asks:

> *Now assume that the government placed a* <u>*required*</u> *$2 surcharge on the monthly electricity bills of all homes and businesses in the United States, including yours, to raise funds for renewable energy. In this case, would your household still be willing to* <u>*voluntarily*</u> *purchase renewable energy for an extra $3 per month in addition to the required $2 charge?*

To this question, 59% said yes, while 41% said no (n = 115). Concerns over crowding-out are not entirely unfounded: the survey results suggest that public policy support for renewable energy may have a negative influence on voluntary consumer demand for green power, but that 100% crowding out is not likely.

The survey also sought to understand consumer preferences for utility-administered green power programs versus those in restructured markets that require a customer to switch electricity providers. Specifically, for those respondents who previously indicated a WTP for renewable energy, the survey asked:

> *These voluntary renewable energy programs can be designed in many ways. As noted earlier, in some states households have the option of choosing which company will provide their electricity and can choose a new electricity supplier that sells renewable energy. In other states, households can only purchase renewable energy from their existing electric utility. If you could choose, which of these two options would be more appealing to you?*

A large majority of survey respondents – 67% – preferred a program offered by their existing electric utility, while just 33% preferred a program offered by a new electricity supplier (n = 108).

The next question asked what concerns respondents have about voluntarily purchasing renewable energy:

> *There are many possible concerns that people might have about voluntarily*

purchasing renewable energy from one of these programs. Of the possible concerns listed below, please circle all that apply to you and your household.

Table 6-20 lists the response categories offered, and summarizes the data received.

Table 6-20. Concerns Expressed about Green Power Marketing

Response Category	Overall Response	Response of Those Who Expressed a WTP	Response of Those Who Did Not Express a WTP
I'm not sure my household could afford the extra cost of renewable energy	38%	25%	58%
Renewable energy just isn't that important to my household	17%	7%	32%
Renewable energy benefits everyone so everyone should be required to pay (i.e., it shouldn't be voluntary)	38%	49%	22%
I am not sure I would trust my electric utility or these new companies to effectively provide renewable energy	42%	42%	42%
I wouldn't trust the new companies to provide high-quality service	34%	32%	38%
Other	8%	7%	10%
Sample Size	*n = 195*	*n = 117*	*n = 77*

The most common concerns expressed in aggregate include issues of trust, affordability, and parity (renewable energy benefits everyone, so everyone should pay). Interestingly, those who expressed a willingness to pay for renewable energy in an earlier question are just as concerned about trust as those who were not willing to pay the $3 monthly premium. Not surprisingly, respondents who indicated an unwillingness to pay the premium are substantially more concerned about affordability and are more likely to indicate that renewable energy is not important to them. Those who indicated they were willing to pay, meanwhile, are far more concerned about spreading the cost of renewable energy across all consumers.

The opinion survey also directly asked a question related to “participation expectations” and the “bandwagon” or “reciprocity” effect:

Which one of the following statements do you most agree with:

1 *My household would be more interested in purchasing renewable energy if we knew that lots of other households were also purchasing renewable energy*

2 *My household would not be affected by the behavior of other households when deciding whether to purchase renewable energy*

3 *My household would be less interested in purchasing renewable energy if we knew that lots of other households were also purchasing renewable energy*

Previous findings on “participation expectations” were only able to identify a positive correlation between one’s own WTP and the expectations of the willingness to pay of others. The meaning or cause of this result was left undetermined. Results from the opinion survey, however, are not only supportive of the earlier “participation expectations” result, but also directly indicate a “bandwagon” or “reciprocity” effect. That is, opinion survey results support causation between WTP expectations and one’s own willingness to pay. There is therefore some evidence that it is because lots of others are expected to pay that some of the survey respondents indicate a willingness to pay themselves.

In particular, opinion survey results show that 46% of respondents say they would be more interested in purchasing renewable energy if they knew that others were doing so, while just 5% say they would be less interested. Another 49% say they would be unaffected by the behavior of others. This “bandwagon” or “reciprocity” effect also appears more pronounced for those who indicated they would be willing to pay for renewable energy than for those who indicated otherwise. Specifically, of those who do express a willingness to pay, 53% would be more interested in they knew lots of others were also purchasing renewable energy, 3% would be less interested, and 44% would not be affected. Of those not willing to pay for renewable energy, the percentages are 36%, 8%, and 57%. This finding suggests that people are sensitive to what others are doing and may not contribute towards renewable energy if they are not confident that others are contributing as well. It deserves note, however, that many questions remain unanswered, including the aggregate size and cause of the effect. As mentioned earlier, these issues, and the need for further research in this area, are discussed further in Section 6.8.

The survey then asked whether voluntary green power demand might replace or supplement the need for government intervention to support renewable energy:

> *If every household and business in the United States had the chance to voluntarily purchase renewable energy through one of these programs, how do you think that would affect the need for the government to continue its support of renewable energy?*

Table 6-21 shows the results of this question by response category. As shown, few respondents believe that voluntary efforts would eliminate the need for continued governmental involvement. However, respondents vary on whether they believe that voluntary options would decrease, increase, or have no effect on government policy.

Table 6-21. Impact of Green Power Marketing on Government's Role

Response Category	Overall Response	Response of Those Who Expressed a WTP	Response of Those Who Did Not Express a WTP
Government support would no longer be necessary	12%	9%	17%
The need for government support would decrease somewhat	38%	43%	28%
It would have no effect on the need for government support	25%	29%	19%
The need for government support would increase somewhat	26%	19%	36%
Sample Size	*n = 192*	*n = 119*	*n = 72*

Finally, the survey asked two more philosophical questions:

Please indicate how strongly you disagree or agree with the following statement: "People generally act in their own self-interest when they purchase consumer products and services."

Please indicate how strongly you disagree or agree with the following statement: "People generally act in their own self-interest when they vote for political candidates and initiatives."

Respondents were asked to rate their responses on a 5-point scale, from 1 (strongly disagree) to 5 (strongly agree). Interestingly, responses to these two questions do not differ appreciably: the mean equals 4.12 for the first and 4.08 for the second question. Apparently, survey respondents do not believe that self-interested behavior is curtailed in a political setting relative to a consumer setting.

6.6 Summary of Findings

The main objective of this research has been to test the hypothesis that individuals' stated WTP for a public good will differ based on the way in which the good is provided and funded. The final sections of this chapter describe the implications of my results for: (1) the methodology and practice of contingent valuation, (2) understanding the nature and magnitude of the "participation expectations" finding, and (3) policymakers and marketers interested in supporting renewable energy. Before detailing these implications, however, here I briefly summarize the key findings of this work:

- **Contingent valuation responses are somewhat sensitive to payment and provision context.** Using both bivariate and multivariate analysis, I find a statistically significant difference in WTP responses in two of four pair wise comparisons. I find evidence that elicited WTP is higher under a collective payment method than under a voluntary one. Similarly, I find evidence that stated WTP under a private provision arrangement exceeds WTP under government provision. While evidence for these conclusions exists, it should be noted that the absolute magnitude of the effects are not always sizable, especially at higher bid levels. The results are also largely driven by survey responses to just one scenario at one bid level: Scenario 4 at 50 cents/month.

- **Responses to the "certainty" and "participation expectations" questions provide further evidence of a preference for collective payments.** In particular, a greater uncertainty in WTP response was found in Scenario 3 – voluntary payment, private provision – than under any other scenario. More persuasively (because Scenario 3 also includes customer switching, which confounds an interpretation of the results), when confronted with the "participation expectations" question, survey respondents expected a higher WTP under collective payment than under voluntary payment.

- **Contingent valuation responses are strongly correlated to expectations for the willingness to pay of others.** Those survey respondents who indicate a willingness to pay for renewable energy are systematically more likely to also believe that many other U.S. residents would also pay the specified premium for renewable energy. This is true across all payment and provision scenarios, and the magnitude of the effect is sizable. Also interesting is that survey respondents generally feel that they are more likely to be willing to pay for renewable energy than other U.S. residents.

- **Regression analysis supports the construct validity of this CV application and identifies correlates to WTP.** The probability of a "yes" response to the valuation question varies with a number of explanatory variables in a reasonable and expected fashion, thereby offering some support for the construct validity of this CV application. Results from this analysis also identify a number of socioeconomic, demographic, and attitudinal correlates to willingness to pay. Several of these correlates lend further support to the "participation expectations" finding.

- **Opinion survey results are consistent with the contingent valuation findings.** Responses to the opinion survey demonstrate provision and payment preferences that are consistent with the findings of the CV study. Collective payment is moderately preferred to voluntary payment, while private provision is preferred to government provision. Similarly, I find some evidence of a "bandwagon" or "reciprocity" effect in the opinion survey.

6.7 Implications for Contingent Valuation

Fischhoff and Furby (1988) note that transactions involve three components – the good, the payment, and the social context – while Hoehn and Randall (1987) explain: "CVM [contingent valuation method] designates a class of valuation methods and there is considerable variety within that class. Not all CVM applications are created equal and differences among formats are likely to influence CVM performance… the research task in applied CVM is not to find the unique value of some change in amenities but to determine the value of the change conditioned upon an appropriate specification of the implementation and payment rules… a change in the payment or implementation rule cannot be interpreted meaningfully as information bias."

The results of this study indicate the potential for institutional context (payment and provision rules in particular) to influence CV-derived willingness to pay measures. Though the differences are at times small, and statistical significance can only be claimed in two of four pair-wise comparisons, the results presented here suggest that CV surveys can be somewhat sensitive to changes in payment and provision context. These findings have important implications for the contingent valuation methodology, and should influence: (1) the interpretation of CV-derived welfare impacts of environmental programs, (2) beliefs about the incentive properties of various payment mechanisms commonly used in CV surveys, and (3) the interpretation of criterion validity studies in contingent valuation. These points are described in detail below.

6.7.1 Provision Approach: Government versus Private

Consistent with the results presented in Johnson et al. (1999), my findings provide evidence that CV measures of welfare change can be affected by the provision arrangement. Respondents presented with a renewable energy program that involved government collection and expenditure of funds generally provided lower WTP measures than those respondents faced with private sector provision of the good. Presumably, a greater degree of faith is placed on private sector provision than on government provision.

This result may be of some concern to economists that use CV as an estimate of "unique" welfare impacts because my findings suggest that such "unique" impacts (which are not contingent on the provision arrangement) may not be precisely identifiable with contingent valuation. An important caveat is in order on this point, however – proponents of CV do not generally argue that CV provides a precise estimate of welfare impacts, only a satisfactory estimate, and the provision effects identified in this paper therefore do little to invalidate CV as a potential tool for estimating welfare impacts.

Consequently, the importance of my results on this score are that: (1) they provide additional evidence of the importance of social context and provision arrangements on elicited WTP, and (2) they suggest that, when designing CV scenarios, researchers must consider the provision arrangement as not just a tool to elicit a "unique" valuation estimate, but also as an important element of the valuation itself. If the goal of CV research is to offer a reliable estimate of "unique" value that is divorced from the provision arrangement, CV researchers should consider using multiple provision arrangements to test for such effects.

6.7.2 Payment Method: Collective vs. Voluntary

Of more consequence to contingent valuation are this study's results on WTP sensitivity to collective and voluntary payment methods. As discussed earlier in this chapter, there exist two conflicting theories of behavioral response when an individual is faced with a CV scenario involving voluntary payment. The first assumes that respondents answer CV questions as if they are being faced with a true economic choice to voluntarily contribute. In this case, survey respondents have an incentive to free ride and provide valuation responses that are below those elicited in an incentive-compatible collective payment context. The second possible response recognizes the long-standing concern among economists about strategic behavior in survey settings. In this case, survey respondents will overstate their willingness to pay (i.e., over-bid) when presented with a voluntary payment in order to maintain the option of actually paying for the good at some point in the future.

Results from this study provide evidence that the first effect exerts a slightly more powerful influence on survey responses than the second. Despite concerns raised by Carson et al. (1999) and others, this study finds limited evidence for the magnitude of over-bidding behavior that is posited by those who believe strategic behavior is rampant in CV surveys that lack incentive compatibility. Instead, if anything, I find some evidence of free riding and truth telling when survey respondents are faced with a voluntary payment mechanism. Apparently, some CV respondents recognize the incentive to free ride and respond to non-incentive compatible CV surveys as if they involved real economic commitments.[69] The importance of this finding to the CV literature is twofold, as discussed below.

Private versus Public Goods Models in Contingent Valuation Studies

The hypothetical market included in CV surveys may be modeled as a private good (voluntary payments) or a public good (collective payments). Early CV studies often used voluntary payment methods (the private good model) to elicit WTP or did not make it clear whether payment was voluntary or collective (see, e.g., Desvousges et al. 1996). More recent CV studies have noted the poor incentive properties of voluntary payment methods, and have instead generally used clearly specified collective payment

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[69] I should note several other possible explanations for the relatively modest difference between voluntary and collective WTP as elicited through this CV survey. First, it is possible that survey respondents are simply inattentive to the payment method when answering CV questions and did not pay great attention to this detail when answering. Second, and related, responses may reflect a participants' expressed preferences for renewable energy rather than a detailed evaluation of the payment method per se; in this case, respondents may treat the proposal as symbolic of a larger policy and ignore the details. Third, respondents may be answering the survey truthfully and simply not fully recognize a difference between voluntary and collective WTP or the existence of free riding or strategic behavior incentives.

scenarios.[70] Though criticisms of voluntary payment methods in hypothetical CV surveys are becoming more common (see, e.g., Carson et al. 1999, Randall 1996), these criticisms are based largely on economic theory and concerns over incentive compatibility as opposed to empirical evidence.

Despite theoretical predictions and concerns to the contrary, my study shows that valuation responses to CV surveys based on voluntary payments are not overstated *relative* to the incentive-compatible collective payment approach. Instead, where differences do exist, eliciting payments based on voluntary payments appears to provide a more conservative estimate of willingness to pay. Moreover, differences in voluntary and collective WTP, especially at high bid levels, are not particularly striking. Theoretical concerns notwithstanding, this study suggests that selection of an incentive-compatible collective payment approach or a non-incentive compatible voluntary approach may not be a decisive factor in CV surveys. I find little empirical evidence of strong misstatement effects and strategic behavior when survey participants are faced with voluntary payments, at least relative to an incentive-compatible design. At the least, the present practice of some CV researchers to use incentive-compatibility arguments to dismiss CV studies that utilize voluntary payments appears imprudent.

Interpreting Criterion Validity Studies

Of even more importance are the implications of these findings for the interpretation of criterion validity studies. A central question regarding contingent

[70] It deserves note, however, that some contemporary CV studies continue to place credence on voluntary payment methods despite incentive compatibility concerns (see, e.g., Stevens et al. 1991, Berrens et al. 1998, Champ et al. 1997).

valuation is whether the values elicited from hypothetical surveys reflect the amounts individuals would actually pay for proposed programs. Criterion validity studies assess the difference between hypothetical statements of WTP as expressed in CV surveys and actual WTP as expressed through true market behavior. A large number of such studies have been undertaken using private goods,[71] voluntary contributions to public goods,[72] and mandatory contributions to public goods through referenda.[73] While methods and results vary considerably across studies, the weight of the evidence suggests that hypothetical values are often greater than values as expressed through real economic commitments; this finding appears especially true when voluntary contributions to public goods are involved.

Critics of CV point to these results as showing that CV-derived WTP estimates – even if elicited with "state of the art" methods – are biased upwards (Cummings and Harrison 1994). Perhaps respondents who are uncertain of their precise valuation will simply say "yes" to a CV question when presented with a "reasonable" price, for example, or do not fully consider budget constraints when faced with a hypothetical question, or simply wish to register their positive opinion of the good by indicating their willingness to pay regardless of the payment level. To counter this criticism, proponents of CV have authored a number of studies that search for ways to eliminate "hypothetical"

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[71] See, e.g., Loomis et al. (1997), Johannesson et al. (1998), Smith and Mansfield (1998), Kealy et al. (1988), Dickie et al. (1987), Blumenschein et al. (1998), Neill et al. (1994), Coursey et al. (1987), Bishop and Heberlein (1979), Cummings et al. (1995), Frykblom (1997).

[72] See, e.g., Seip and Strand (1992), Sinden (1988), Kealy et al. (1990), Shechter et al. (1998), Foster et al. (1997), Champ et al. (1997), Ethier et al. (2000), Byrnes et al. (1999), Spencer et al. (1998).

[73] See, e.g., Cummings and Taylor (1998), Cummings et al. (1997), Taylor (1998).

bias through calibration, wordsmithing, and other approaches. [74] In each case, the intent is to reduce CV valuation estimates so that they converge with evidence from real economic commitments.

Another group of CV practitioners defends the contingent valuation method on different grounds. This group takes issue with the design and incentive properties of the criterion validity studies, which they argue offer fertile ground for free riding and strategic behavior and do not represent the "state of the art" in contingent valuation (Randall 1998).[75] In particular, economic theory predicts that individuals who are faced with an *actual* opportunity to voluntarily contribute to public goods will generally not do so, and will instead free ride. Additionally, as already attributed to Carson et al. (1999) and Carson (1997), *hypothetical* voluntary payments, whether for public or private goods, have been predicted to lead to strategic behavior and over-bidding relative to the "true" valuations that would derive from collective payment mechanisms. These authors therefore argue that it is not CV – properly designed – that is biased, but rather the design of the criterion validity tests. In fact, considering these two incentives, Carson (1997) concludes: "voluntary contribution mechanisms should generally be avoided in CV surveys." The standard collective payment measure is recommended in its stead.

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[74] Some have suggested calibration – simply "correcting" CV estimates by scaling them down by a factor that is derived through experimentation (see, for example, Champ and Bishop 1998, List and Shogren 1998, Fox et al. 1998, Blackburn et al. 1994, Mansfield 1998). An alternative approach is through various types of "wordsmithing" to induce responses to hypothetical questions to mimic responses made by subjects facing actual payments (Loomis et al. 1994, Neill 1995, Cummings and Osborne 1996, Loomis et al. 1996). Still others suggest a "learning" design with more than one CV iteration (Bjornstad et al 1997), or a provision point mechanism (Prince et al. 1992).

[75] Randall (1998) notes: "Existing literature provides considerable testimony to the tendency of researchers to pay too little attention to the incentives inherent in the contingent choice format and its actual choice counterpart, and to overinterpret the results, implying that results found with particular contingent choice formats can be generalized to CV at large."

Results from my survey place some doubt on these latter arguments, and provide tentative support for the serious concern of upward bias in even well designed CV surveys. In particular, the arguments raised above suggest that when voluntary contributions to public goods are involved actual contributions will be biased downwards by free riding and hypothetical contributions will be biased upwards by over-bidding. While my study was not designed to test for free riding effects when *real* payments are involved, it finds no evidence of overbidding in the hypothetical voluntary payment condition relative to an incentive compatible, collective payment design. This casts doubt on at least one of the two arguments for why hypothetical voluntary payments to public goods may exceed actual payments. The two remaining possibilities include: (1) free riding in the actual payment condition, or (2) an overall upwards bias in CV responses, whether collective or voluntary payments are used. Nothing in my survey can distinguish the relative importance of these two effects in a public goods context.

If the results of this study are extrapolated to a private goods context, however, they provide further evidence that upwards bias in CV responses should be a serious concern. As already noted, observed differences between hypothetical purchase intentions and actual purchases of private goods are sometime attributed to strategic overstatement in the *hypothetical* payment condition; for private goods, the *actual* payment condition is incentive compatible because free-riding incentives are absent. At least for public goods, however, I find no evidence of strategic overstatement. Absent evidence to the contrary, I suspect that strategic overstatement in a private goods context is equally unlikely. If this is so, the only remaining explanation for differences between hypothetical and actual payments to private goods in well-designed studies is that there is a general upwards bias in response to hypothetical CV questions.

This upwards bias may be caused by a number of factors, including a lack of consideration for budgetary limitations, the respondents' desires to express their preferences for renewable energy regardless of the payment amount, or by perceived social pressure. Regardless of the reason for the bias, however, an appeal to the possibility of strategic overbidding incentives may not be enough to vindicate CV in the face of criterion validity studies. While no one experiment is definitive, my findings should be of some concern to CV practitioners.

6.8 Implications of the "Participation Expectations" Effect: A Call for More Research

This study also contributes, albeit more modestly, to the collective action and related literatures on interpersonal influence, reciprocity, trust in others, and bandwagon effects. Perhaps more important than its direct contributions to these literatures, however, the findings of this chapter point to research questions that deserve additional attention. Here I briefly summarize the various academic literatures that relate to "participation expectations," describe the results of my study and how they relate to the extant literature, and highlight open research questions that remain unanswered by my results.

A variety of academic literatures have noted the prevalence of the "participation expectations" effect and of interpersonal influence in decision-making more broadly. As discussed earlier, two of the more relevant papers include Orbell and Dawes (1991) and Dawes, McTavish and Shaklee (1977), both of which conclude that, in experimental settings, contributors to public goods expect significantly more cooperation than do defectors. A related study by Pieters et al. (1998) shows that the expected pro-environmental behavior of other households is positively correlated with individuals' own environmental behaviors.

Others have gone even farther by claiming a causal relationship: people are not only sensitive to what others are doing, but may not participate in an activity unless they are confident that others are participating as well. For example, in sociology the prevalence of "bandwagon" or "critical mass" effects is often noted in studies of how innovations diffuse through society and in studies of how collective action problems can be solved when interpersonal networks and social norms become activated (Rogers 1962, Marwell et al. 2000, Macy 1991, Elster 1989, Oliver 1993). Indeed, the presence and importance of interpersonal influence, norms of behavior, and social reference groups is the foundation of much of discipline of sociology. In evaluations of environmental attitudes and behaviors, studies often find that individuals who rank higher in "trust" or "faith in others" also contribute more to environmental causes,[76] and that social influences affect behavior (Manzo and Weinstein 1987, Osterhus 1997, Lutzenhiser 1993, LaTour and Manrai 1989, Bearden et al. 1989). It is also widely believed that one person's charitable contributions can be significantly influenced by the contributions of others. Marketers, meanwhile, describe the difficultly of "crossing the chasm" to reach critical mass in product sales (Moore 1991), while economists and political scientists sometimes find evidence for bandwagon effects in voting behavior (Hong and Konrad

[76] The same effect is found in other "social dilemmas" as well. See Piliavin and Charng (1990) for a list of some of these studies.

1998). Finally, in the collective action literature, Sugden (1984), Chong (1991), Lichbach (1996) and others highlight the importance of reciprocity in providing incentives to contribute; contributions are often matched with contributions, while defection is matched with defection. Formally, game theorists and others note that if individuals can contribute to public goods contingent upon other participants, they can sometimes "solve" the free rider dilemma (Carson and Mitchell 1989, Axelrod 1984, Cornes and Sandler 1986).

While discussion of the influence of such factors is prevalent in other disciplines, these effects have not been thoroughly tested in CV research, where a narrow focus on economic motivations that assume rational maximizing behavior and independent choices often pervades research agendas.[77] This study takes a preliminary step in the direction of testing for "participation expectations" in a contingent valuation setting. As already highlighted, I find substantial evidence that those who indicate a willingness to pay for renewable energy are also far more likely to believe that many others would also contribute. This is equally true under both voluntary and collective payment methods. Apparently, this "participation expectation" result is not limited to cases of voluntary payments, but is also reflected in referendum-style policy decisions. I also find that both

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[77] Some exceptions do exist. Fischhoff and Furby (1988), Blamey (1998), and Harris et al. (1989), for example, note the importance of social context and the possible influence of others in CV transactions in a qualitative fashion, while Vadnjal and O'Conner (1994), Shechter et al. (1998) and Schkade and Payne (1994) note this influence after interviewing or surveying CV respondents. Others have explicitly explored the impact of "reminders" of others' contributions on WTP. Green et al. (1994), for example, reminded survey respondents that a large number of other individuals would also be asked for contributions. When they did so, a higher percentage of survey respondents indicated that they also would contribute, but the actual amount of each contribution was lower. Baron and Maxwell (1996) conducted a similar study with similar results, while Bohara et al. (1998) find similar results under an open-ended elicitation format but that a dichotomous choice format is immune to this effect. These findings are reminiscent of the "bystander" effect discussed in the social sciences. Under the bystander effect, the knowledge of others' potential participation inhibits contributions because of a diffusion of perceived responsibility.

the aggregate expected WTP of others and the support of near peers (family and friends) have separate and important relationships to an individual's stated willingness to pay.

By illustrating the apparent importance of such social influences in a contingent valuation setting, my study extends a large body of other work that has explored these concepts in more detail. These results seemingly illustrate the complexity of individual decision-making. Free riding behavior as described by economics typically posits a utilitarian choice and assumes individualism, maximization of self-interest, and rationality. At least in its pure form, this theory does not appear to pay enough attention to the social nature of the choice in question, and in particular the apparent social interdependence of choices. The results of my analysis suggest that there is a need to include social factors in understanding choice behavior when public goods are involved, and for understanding responses to contingent valuation surveys.

It must be noted, however, that much remains to be done to make these findings and their implications actionable in a practical or theoretical sense. One issue that deserves further attention is that of causality and the "bandwagon" or "reciprocity" effect. Specifically, is it because others are expected to contribute that survey respondents also indicate a willingness to pay? Or, do respondents who say they are willing to pay simply "defend" their choice by saying that they believe others would make a similar one? Put another way, is it beliefs causing choice, or choice causing beliefs?[78] Evidence for both effects is offered in the extant literature. My opinion survey results are suggestive of a true bandwagon or reciprocity effect (beliefs causing choice), but contingent valuation

[78] Dawes, McTavish and Shaklee (1977), for example, argue that it is choice causing beliefs rather than beliefs causing choice.

responses merely indicate a positive correlation between WTP and “participation expectations,” not a direction of causality. More research will be needed to further test for a true bandwagon or reciprocity effect and to understand the magnitude and importance of that effect, both in hypothetical survey settings and in actual choice situations involving renewable energy products.

Another necessary area of further research is to understand the causes of the “participation expectations” results. Several possible causes based on the extant literature include (1) satisficing or imitation behavior (i.e., if others are doing it, it must be ok), (2) concerns over fairness in payment, (3) the effects of social pressure or social reference groups, (4) norms of reciprocity or cooperation, (5) a belief that the social and psychological benefits of participation will only be operative if a significant number of others also participate, and (6) a belief that the action will only be successful if others also contribute.

While the positive correlation between WTP and “participation expectations” is strong, and some evidence has been presented that is suggestive of the bandwagon/reciprocity effect, it should be clear that the results presented here are not sufficient to truly understand the nature and magnitude of these influences. In the meantime, my findings do have at least two tentative implications of interest to CV practitioners and environmental marketers. First, for environmental marketers, these findings are supportive of the concerns and marketing suggestions offered by Smith and Haugtvedt (1995) and Weiner and Doescher (1991). In both cases, the authors note that concerns that others may not contribute may partially explain the gap between environmental attitudes and environmental behaviors, and suggest that to be successful social marketers must persuade individuals that others will also contribute. Second, in contingent valuation, a modest debate has arisen over whether survey participants should be informed of the valuation responses of others. Economists in this debate argue that providing survey respondents information on the bids by other subjects could induce strategic behavior or reliance on the “informed” bids of others in formulating one’s own answers (Arrow 1986, Freeman 1986). Kahnemann (1986), meanwhile, sees such information as an integral part of the valuation process – any one individual’s WTP is inextricably linked to what others are paying. While my findings cannot be used to determine which argument is “correct” in an objective sense, they do suggest that individuals may come into a valuation exercise already holding views on the likely contributions of others and that these views may affect valuation responses.

6.9 Conclusions and Implications for Renewable Energy Programs

Policymakers should care about the impacts of payment and provision context on stated willingness to pay because these effects have ramifications for how environmental programs could most effectively be funded. Marketers, meanwhile, can benefit from information on the barriers to green power market development. I conclude this chapter by describing the implications of my work for renewables policy and green power marketing.

6.9.1 Payment Preferences and Renewable Energy Support Options

A variety of approaches can be used to support renewable power generation. At present, three approaches have gained prominence in the U.S. and overseas: (1) the renewables portfolio standard (RPS) – a mandatory requirement that electricity suppliers deliver a certain percentage of renewable energy (Scenario 4), (2) the system benefits charge (SBC) – a surcharge on electricity bills, the funds from which are used to support renewable energy (Scenario 1), and (3) green power marketing – relying on customers to voluntarily purchase renewable energy from electricity suppliers (Scenario 3).

The survey results presented here provide some insight into the preferences of U.S. residents towards these approaches, as well as the opportunities and challenges facing voluntary customer demand for renewable energy. The option that elicits the highest WTP in the CV survey is the RPS. This is not surprising because both the CV and opinion survey uncovered preferences for collective payment and private provision. The SBC and green power marketing are viewed almost equally. Looking at any individual bid level, however, these differences are not always striking. At the 50¢/month bid level, for example, 79% of respondents indicate a willingness to pay for an RPS, 63% for an SBC, and 59% for a voluntary green power product. At higher bid levels, the differences become even more modest. From a policy standpoint, however, such comparisons are not as meaningful as looking across bid levels. Green power products on the market today often cost $5-10/month more than traditional electric service for a typical household; the cost of RPS and SBC policies is typically estimated to be below $1/month for residential customers. Comparing the RPS and SBC at 50¢/month to green power marketing at $8/month leads to an attenuation of preferences. The RPS and SBC are still supported at 79% and 63%, but stated participation in voluntary green power programs drops to 44%.

Results from other questions in the CV and opinion surveys lend further support to these conclusions. Those survey respondents who indicated a willingness to pay for renewable energy on a voluntary basis from green power marketers were also less sure of their responses than were those who were asked a similar question involving collective payment. Similarly, when asked about the participation expectations of others, survey respondents consistently indicated that they would expect a higher WTP under collective payment than under voluntary payment. Moving to the opinion survey, respondents modestly preferred collective payment and private provision over voluntary payment and government provision. When asked how the availability of voluntary green power choices would affect the need for the government to continue its support of renewable energy, only 12% of respondents felt that government support would no longer be necessary. 51% felt that the need for government support would remain the same or increase, while 38% felt that government support could decrease somewhat.

In sum, survey results show a preference for collective payment and private provision, and further demonstrate that a majority of U.S. residents do not believe that voluntary green power options will eliminate the need for continued government policy supports for renewable energy. It deserves mention, however, that the strength of these preferences (as expressed in a survey setting) is perhaps not as high as what one might expect for a good (renewable energy) that provides public benefits. In the opinion survey, for example, collective payment is preferred over voluntary payment by a slim 53% to 47% margin; private provision is preferred to governmental provision on a 54% to 46% basis. Not surprisingly, those who believe renewable energy production should be increased, even if it costs more, are far more likely to prefer collective payment, while those who do not feel that renewable energy merits further support prefer voluntary payments. What is somewhat surprising is that just 55% of respondents say that renewable energy should be increased, even if it costs more than other electricity production options. This finding differs from the reported results of many other surveys that show large majorities of U.S. residents supporting renewable energy. Apparently, at least in this survey setting, U.S. residents do not recognize the need for collective action for renewable energy to the degree that one might expect.

6.9.2 The Limits of Green Markets

Though research presented in this chapter shows that collective measures of policy support are generally viewed as preferable to voluntary efforts, 44% of respondents still indicate a willingness to pay for a green power product priced at $8 per month. Moreover, respondents believe that 32% of other U.S. residents would be willing to pay. Both of these WTP numbers are considerably above the 0.1% to 7% market penetration rate of actual green power offerings to date in the United States. What explains the difference?

Though the research presented here was not designed to answer this question directly, it does offer some insight. First, economic theory suggests that reliance on voluntary green power demand may be precarious because free riding would be expected to dominate actual purchase decisions. While free riding has been posited to exist in theory, and has been shown to exist in experimental settings, using survey responses my research shows a preference for collective payments over voluntary payments, and therefore suggests that free riding may play a specific role in thwarting voluntary contributions to environmental causes. This preference for collective action rather than reliance on voluntary demand may be an even stronger factor in an actual payment condition than under the hypothetical survey situation tested in this chapter. Second, as was suggested earlier, survey results offer some evidence of an upwards bias in responses to hypothetical CV willingness to pay questions.

Free riding in an actual payment condition and upwards bias in hypothetical statements of willingness to pay are not the only plausible explanations for the difference between expressed preferences for renewable energy and actual purchase behavior. Survey results suggest four other explanations not historically emphasized in the economics literature.

- **Bandwagon Effects, Critical Mass, and Reciprocity.** Though the findings are still tentative and additional research is required, CV results show a strong positive correlation between stated WTP and the expectations for the WTP of others. Opinion survey results go one step farther and show that the participation decisions of others (or the perceptions of those decisions) may have a direct and causal influence on individuals' own participation: higher levels of participation by others increases one's own WTP. Results also show that respondents believe that a large number of U.S. residents would be willing to pay a premium to purchase a green power product. At an $8 per month premium, for example, those who expressed a willingness to pay for renewable energy indicate that they believe 40% of other U.S. residents would also pay, while those who are not WTP believe that 25% of others would pay. These results suggest that anemic participation rates in actual green power programs may, in part, be a self-fulfilling prophecy. Without a “critical mass” of participants, households may become disillusioned and choose not to participate. Pending further confirmation through additional research, the findings presented here suggests that the most difficult part of developing the green power market may be to develop a stable base of contributors on which further contributions can grow.

- **Knowledge of Green Power Availability.** As with any new product on the market, heavy marketing is often needed to educate and inform potential purchasers of the product and its benefits. Opinion survey results show that just 8% of respondents believe that a green power product is available for purchase in their region. With actual availability at approximately 40% nationwide, it is evident that a large number of potential green power buyers are simply unaware of the products that are available.

- **Hesitancy in Switching Electricity Providers.** The least amount of respondent certainty surrounded willingness to pay responses to the green power marketing CV scenario, which involved switching to a new electricity provider. Meanwhile, for those respondents who indicated they were not willing to pay under this scenario, a need for further information was cited as an important reason; 25% of these respondents also indicated that they would not want to switch electricity providers for other reasons. Finally, in the opinion survey utility provision of green power was preferred on a 67% to 33% basis over purchasing green power by switching to a new electricity supplier.

- **Trust in the Product.** A great deal of distrust was expressed in the CV and opinion surveys about both government and private provision of renewable energy. Of those who indicated they were not willing to pay for renewable energy in the CV surveys, however, the greatest amount of distrust was expressed in the voluntary green power marketing scenario (Scenario 3). In the opinion survey, among those who expressed interest in purchasing green power, two of the most significant concerns (expressed by 42% and 32% of respondents, respectively) were a lack of trust in the electricity supplier to effectively provide renewable energy and a lack of trust in that supplier to provide high quality service.

Apparently, if demand for green power is to increase appreciably not only will the standard economic barrier of free-riding stand in the way, but so too will a host of other barriers to volunteerism in the green market.

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Chapter 7

Conclusions

People are central to environmental protection and improvement. As individuals, their preferences and demands influence the decisions of manufacturers to invest in environmentally friendly products and production processes. As voters, their attitudes and voting behaviors affect the government regulations and policies that establish environmental compliance requirements and incentives for clean production. Finally, as consumers, the purchase of “green” products can directly mitigate the impact of people’s purchasing behavior on the environment.

This dissertation has investigated green product purchases, recognized by some observers as perhaps the most precarious of the three ways in which individuals can support environmental improvement. After all, as environmental marketing has grown it has faced a seemingly paradoxical coincidence of broad adoption of pro-environmental attitudes and yet only marginal or non-existent changes in pro-environmental consumer behavior and purchasing patterns. In fact, surveys of consumer attitudes and even intended behavior are notoriously poor in estimating actual purchase behavior. Apparently, despite overwhelmingly positive attitudes about the environment, these attitudes are not translating into broad scale behavioral change by most consumers.

Under what conditions are private individuals willing to voluntarily pay for public environmental goods, and why do environmental attitudes not directly translate into pro-environmental behaviors and purchasing actions? While a variety of factors might constrain the interest and ability of individuals to proactively apply their environmental attitudes in purchasing decisions, the economics profession, and the public goods/collective action branch in particular, would ascribe this difference primarily to individual incentives to free ride and therefore not contribute to the provision of public goods in a voluntary setting. After all, why contribute to public goods voluntarily when others will benefit from your actions and may not reciprocate themselves? In such circumstances, individual provision of public environmental benefits is unlikely; in its stead, collective action through governmental policy is typically needed. In fact, due to the incentive to free ride when *voluntary contributions* to public goods are involved, the collective action literature would lead one to believe that people will generally prefer *collective payment* regimes in which free riding is not an option. Even under collective payment regimes, however, strict preferences should be held for collective payments that span the relevant public good. For example, international action may be necessary to overcome free-riding incentives related to global climate change, while regional action may be sufficient for typical air quality concerns.

This dissertation has explored the gap between environmental attitudes and behaviors by empirically investigating one product market: voluntary demand for renewable energy. Much of the extant environmental marketing literature has, thus far, been practitioner-oriented and has not attempted to develop broader theoretical constructs. Work reported in this dissertation represents an attempt to move beyond the simple reporting of green product case studies, and to begin to explore a theoretical framework for understanding the difficulties of marketing a green product. I have specifically sought to identify the importance of free riding and collective payment preferences, as well as other factors, in creating the gap between stated and actual willingness to pay. Using a sometimes-eclectic set of methods and perspectives, each chapter has explored this market from a different perspective. Here I attempt to integrate these somewhat disparate pieces of work to both summarize the main findings and to identify important research questions that remain unanswered.

As for the key findings of this work, as detailed below I have: (1) discovered some limitations in the use of the traditional free-rider theory to explain consumer decision making, (2) identified a variety of barriers to growing the green power market that extend well beyond free-riding and collective payment preferences, (3) presented a more complex and nuanced understanding of the green market than typically offered by neoclassical economics or environmental marketing, and (4) concluded that voluntary consumer demand for renewable energy is unlikely to contribute significantly to meeting energy policy goals in the near to medium term.

To support these broad conclusions and integrate the findings of this dissertation, I begin in Section 7.1 by re-documenting the sizable gap between stated willingness to pay for renewable energy and actual participation in green power programs; I also provide some evidence that this gap is only partially explained by free-riding behavior. In Section 7.2, I provide further evidence that free-riding behavior and preferences for collective payments may not be the only, or even the most significant, barrier to the voluntary green power market. In particular, I present evidence that individuals and organizations prefer collective payment methods for renewable energy to voluntary ones, but that these preferences are not as strong as might be expected based on the public goods theory. Section 7.3 summarizes other factors that help widen the gap between stated willingness to pay for renewable energy and observed participation in green power programs, and that are unrelated to the free-riding hypothesis. In Section 7.4, I summarize survey findings that show the complexity of consumer decision-making, and I contrast these findings with the simplistic model of decision-making sometimes associated with neoclassical economics and the free-riding theory. As is perhaps true with many dissertations, my research has seemingly uncovered as many questions as it has answered; Section 7.5 therefore highlights some of the key unanswered questions that await further research. The chapter concludes with some remarks on the overall implications of my work for the longer-term fate of the green power market.

7.1 The Willingness to Pay "Gap": Free Riding as a Partial Theory

This dissertation shows that the wide discrepancy between environmental attitudes and behaviors is also in evidence in the emerging green power market, and that free-riding and payment preferences are at best a partial explanation. The contingent valuation survey demonstrates that 44% of U.S. residents indicate a willingness to voluntarily pay $8/month to switch electricity suppliers and purchase a green power product. At $3 per month, stated willingness to pay grows to 57%. And yet, this dissertation has also shown that typical market response to green power products averages just 1% of households, with a high of 7%. Though there are clearly some residential and non-residential customers that are willing to voluntarily pay more for renewable energy and thereby help provide environmental public goods, a result inconsistent with at least the "strong" version of the free rider hypothesis, the gap between stated intentions and actual response to green power offers so far is sizable. The voluntary green power market has not yet caused significant additions in renewable energy generation or enhancements in environmental improvement.

One possible cause for the discrepancy between general attitudes towards renewable energy and actual purchases is the incentive for free riding, and a related preference for collective payment vehicles. As noted earlier, the economics profession places particular emphasis on this explanation, and there is substantial evidence in experimental economics and other disciplines that free riding can and does occur in some circumstances. A gap between stated and observed willingness to pay may be caused by many factors, however, free riding incentives being only one possible explanation.

In fact, data presented in Chapter 1 show that free-riding behavior is not the only, and perhaps not even the most significant, factor causing the gap. Specifically, researchers have used field studies to evaluate the difference in customer response to hypothetical and actual offers of renewable energy. In these studies, individuals are presented with either a real or hypothetical opportunity to purchase green power over the phone or via the mail. In one study performed in the Midwest, 50% of survey respondents indicated a willingness to pay for a hypothetical offer of wind power at an $8 monthly premium; when presented with an actual offer of the same product, 25% of survey respondents actually signed up. At least in this study, 25% of survey respondents overcame incentives to free ride and preference for collective payment vehicles, and opted to voluntary pay for renewable energy. This level of positive response is not easily explainable within the traditional formulation of the public goods theory and its free–riding hypothesis.

What these results suggest is that the gap between stated willingness to pay for renewable energy and observed participation in green power programs is caused by a multitude of factors. The difference between the 50% of residents who indicate a WTP for renewable energy in a hypothetical setting and the 25% who actually do pay in a similar research setting is suggestive of either free-riding or a systematic bias upwards in hypothetical WTP measures. The gap between the 25% of survey respondents who actually do pay for renewable energy in at least some research settings and the average participation rate of just 1% in actual green power programs, however, must be explained by other factors; appeals to public goods theory, free-riding incentives, and preferences for collective payment vehicles cannot explain this gap.

7.2 Payment Preferences and Free Riding Behavior

Residential and non-residential customer research presented in this dissertation further confirm that free-riding and collective payment preferences constrain customer demand for green power products, but that this constraint is not the sole contributor to the gap between stated intentions and observed willingness to pay. In particular, I present evidence that individuals and organizations prefer collective payment methods for renewable energy to voluntary ones, but that at least among U.S. residents these preferences are not as strong as might be expected.

Chapter 6 explores payment preferences for renewable energy through the implementation of 1,574 contingent valuation and 202 opinion surveys. Though the data are not as conclusive as one might hope, I find that there is a modest difference between collective and individual preferences. U.S. residents are shown to express a higher willingness to pay for collective policy efforts – and the renewables portfolio standard (RPS) in particular – than for voluntary green power options. While free riding has been posited to exist in theory, and has been shown to exist in experimental settings, my research offers some evidence of free riding in even a hypothetical survey setting.[79] The survey of non-residential green power customers presented in Chapter 4 is more conclusive about payment preferences: respondents strongly preferred collective policy efforts to support renewable energy over voluntary ones. Each of these findings is suggestive that free-riding and collective payment preferences may be constraining voluntary demand for green power products. Moreover, if these incentives and preferences hold in a hypothetical survey setting, they may be even stronger when actual payments are involved.

And yet, expressed preferences for collective payment measures over voluntary ones among U.S. residents are far lower than one might expect for a good (renewable energy) that provides public benefits. Collective and voluntary payment measures elicit only small differences in willingness to pay, and survey respondents indicate only a very modest preference for collective payments in the opinion survey. Moreover, survey respondents express a belief that voluntary green power programs will elicit a much higher level of positive response than actual experience shows. At the same time, support for renewable energy in general is more tepid than one might expect. Apparently, at least

[79] Despite often-cited theoretical predictions to the contrary, I do not find that a voluntary payment approach results in strategic overstatement of WTP relative to an incentive compatible design. As described in detail in Chapter 6, this finding has important implications for the methodology and practice of contingent valuation. In particular, I show that this finding provides some evidence of systematic upwards bias in CV results.

in this survey setting, U.S. residents do not recognize the need for collective action for renewable energy to the degree that one might expect (at least on the national level over which collective payments were proposed in the survey). These findings should be somewhat puzzling to those who believe that free-riding incentives and basic fairness dictate that collective payment measures should be preferred when public goods are involved. As highlighted in a later section of this conclusion, additional research is needed to fully understand these results.

7.3 Other Barriers to Green Power Demand are Significant

Research summarized so far shows that one cannot reasonably label all those who do not purchase green products as public-goods free riders; free riding incentives and preferences for collective payments are not the only explanations for the wide gulf between positive environmental attitudes and actual purchase decisions. Apparently, if demand for green power is to increase significantly, not only will the standard economic barrier of free riding stand in the way, but so too will a host of other barriers to voluntary action not historically emphasized in the economics literature. The research conducted for this dissertation not only dispels the myth that free-riding behavior and collective payment preferences are the sole or perhaps even the primary barriers to growing the voluntary green power market, it also begins to identify what other factors help explain the lack of response to green power offers thus far. Based on the work reported in this dissertation, these barriers include:

- **The Cost of Renewable Energy Relative to its Immediate Value.** When asked whether they would be willing to pay a $3-8 per month premium for renewable energy (the typical amount for green power products), 40-60% of U.S. residents say they would not pay this amount, regardless of whether payments are collective or voluntary. These individuals simply do not care about renewable energy (at least at the cost specified), are concerned about personal budget constraints, or are skeptical of renewable energy programs. Alternatively, these people may simply believe that the benefits of renewable energy will accrue to others, and that neither voluntary nor national collective action will span the relevant public benefit (e.g., carbon reductions benefit future generations and other nations, and the location of the renewable generator may not be sufficiently proximate to benefit the local air quality of the participant). While they are not acting in an altruistic way, these individuals cannot be classified as free riders per se (at least to national collective action) because they express an unwillingness to pay under both collective and voluntary payment. Moreover, contingent valuation survey results offer some evidence of an upwards bias in responses to hypothetical CV questions. An estimate that 40-60% of U.S. residents simply do not value renewable energy sufficiently to be willing to pay should therefore be considered a lower bound. The single largest barrier to green power sales would therefore appear to be a simple lack of interest in paying the requisite premium to support renewable energy.

- **Limited Awareness and Education:** My findings also support the conclusion that a large number of U.S. residents are simply unaware of the green power options that are available to them – opinion survey results show that just 8% of respondents believe that a green power product is available for purchase in their region, while actual availability is nearly 40% nationwide. Intensive education and marketing efforts may therefore be needed to tap this demand. And yet, information presented in Chapter 2 shows that the green power market already experiences high customer acquisition costs and low profitability. Therefore, it is not clear whether green power marketers can incur additional education and awareness building expenses in a profitable fashion. To dramatically increase awareness, it may therefore be necessary for the government to play an education and awareness-building role, immediately raising the question of the relative effectiveness of using funds in this way to support renewable energy relative to other funding options.

- **Lack of Trust in the Supplier and Product:** Many U.S. residents may be willing to pay for renewable energy, but distrust green power marketers to deliver a quality renewable energy product. Of those who indicated they were not willing to pay for renewable energy in the CV surveys, for example, the greatest amount of distrust was expressed in the voluntary green marketing scenario. Meanwhile, even among those who expressed interest in purchasing green power in the opinion survey, two of the most significant concerns (expressed by 42% and 32% of respondents, respectively) were a lack of trust in the electricity supplier to effectively provide renewable energy and a lack of trust in that supplier to provide high quality service. Experience with green power marketers and their products reported in Chapter 2 suggest that these consumer concerns are not entirely unfounded. Especially in restructured markets, the green power products offered by suppliers have sometimes been of low environmental quality, resulting in little incremental renewable generation.

- **Hesitancy in Switching Electricity Providers.** Market experience in restructured states also shows hesitancy on the part of electric customers to switch electricity suppliers. Contingent valuation and opinion survey results confirm this finding. For example, those survey respondents who indicated they were not willing to voluntarily switch electricity providers to select green power cited a need for further information as an important reason; 25% of these respondents also indicated that they would not want to switch electricity providers for other reasons.

- **Interdependent Choices:** Though my findings are still tentative and more research is needed on this point, I provide some evidence that a “bandwagon” or “reciprocity” effect may be inhibiting customer response. Specifically, CV results show a strong positive correlation between stated WTP and the expectations for the WTP of others. Opinion survey results go one step farther and show that the participation decisions of others (or the perceptions of those decisions) may have a direct and causal influence on individuals’ own participation: higher levels of participation by others increases one’s own WTP. These results suggest that anemic participation rates in actual green power programs may, in part, be a self-fulfilling prophecy. Without a "critical mass" of participants, households may become disillusioned and choose not to participate. Pending further confirmation through additional research, the findings presented here suggests that one of the difficult aspects of developing the green power market may be to develop a stable base of contributors on which further contributions can grow.

- **Regulatory Rules that Limit Market Attractiveness:** Challenging the premise that profitable, sizable, credible markets for green products will naturally evolve without supportive public policies, in Chapter 5 of this dissertation I show how regulatory rules and public policies can constrain or encourage green power demand. Especially in restructured market contexts, attractive market rules and public policies will apparently be needed to increase green power demand. Unfortunately, early experience with electric industry restructuring suggests that many of the necessary rules are unlikely in most states in the near future.

7.4 Complexity in Decision Making: Altruism and Interdependence

Research conducted for this dissertation also illustrates a greater degree of complexity in consumer decision-making than often assumed in neoclassical economics and the free-rider theory. Free riding behavior as described by economics typically posits an instrumental- or utilitarian-based decision making process characterized by individualism, maximization of self-interest, and rationality. Findings presented in this dissertation, on the other hand, illustrate the possibility of social interdependence in individual choice settings and altruism among non-residential green power customers.

Interdependent Choices and the Bandwagon or Reciprocity Effect

Consistent with numerous other social science literatures, and as reported above, contingent valuation and opinion surveys of U.S. residents show that individuals' own willingness to pay is strongly correlated to beliefs about what other consumers intend to do. Other evidence suggests not merely a correlation, but also a causal influence of "participation expectations" on stated willingness to pay. These findings seemingly exemplify the complexity and possible interdependence of individual decision-making. Consequently, at least in its pure form, the free-riding theory does not appear to pay enough attention to the social nature of the choice in question, and in particular the apparent social interdependence of choices. Consistent with previous research in the sociology, collective action, and marketing literatures, the results of my analysis show that there may be a need to include social factors in understanding choice behavior when public goods are involved, and for understanding responses to contingent valuation surveys. As described later, however, I also conclude that much more needs to be done to truly understand these social effects.

Altruism among Non-Residential Green Power Customers

Green product purchases by non-residential customers may be motivated by different needs or goals. Some theorists have considered two basic motivations for environmental behaviors: to satisfy self-regarding or instrumental interests and to satisfy other-regarding or altruistic interests. Especially when business customers are involved, the economics literature generally focuses on instrumental reasons for environmental actions: efficiency gains, reducing the risk of future regulation, and improving a firm's public image. This is because economic theory generally treats the firm as a soulless profit-maximizing entity, whose existence is tolerated purely for the transactional convenience of arranging for resource allocation among producers and consumers.

While firms do provide this function, a survey of 464 business, non-profit, and governmental customers already purchasing green power finds that the principal motivator of their green power purchases is altruism, with a secondary motivation of building employee morale. Both of these motives have been downplayed by previous work, which has instead focused on motivations that are tightly linked to direct economic gain. The traditional factors posited for understanding such voluntary environmental initiatives, however, were found to be of secondary importance in my analysis. Among early adopter non-residential customers of green power, which are predominately smaller organizations, a blended set of personal and business motives appear to be at play. Again, this finding conflicts with the instrumental- or utilitarian-based decision-making process posited by the free-riding theory, and suggests that decision-making, even among firms, is sometimes considerably more complex than traditional economic theory predicts.

7.5 Remaining Questions and Research Needs

Research presented in this dissertation shows that free-riding behavior is just one of many reasons for the poor showing of the green power market to date. I have also found consumer decision making to be far more complex than traditional economic models would seem to suggest. These findings raise a number of additional questions that call for more research effort; some of the important areas of additional research need are identified here:

- **Better Understand the Reasons for the Modest Difference Between Preferences for Collective and Voluntary Payments.** Results presented in this dissertation show a much more modest preference for collective payment vehicles among U.S. residents than one might expect based on the public goods theory alone, and therefore question the traditional formulation of the free-rider problem. Further research is needed to explain this puzzling result. In particular, research should explore the relative importance of at least three possible explanations for this finding.
    - First, people seem to believe that voluntary consumer action to support renewable energy can be far more successful than practice bears out; on average, respondents to the CV survey thought that 32% of other U.S. residents would be willing to voluntarily contribute $8 per month to a green power program. It may be that collective policy measures are not strongly preferred simply because people believe that voluntary actions can be effective.
    - Second, survey responses show that another possible reason for the somewhat tepid response to collective policy efforts may be that renewable energy is simply not a highly valued good; when asked whether

renewable energy generation should be increased, even if it cost a bit more, just 55% responded affirmatively.

- Finally, the survey uncovered some distrust for the government's ability to provide renewable energy effectively; people may therefore believe that "governmental failure" is just as significant under collective payments as "market failure" is under voluntary payments. One possible concern raised earlier is that people may believe that *global* collective action on renewable energy is necessary given the global benefits that those technologies provide, while the survey posited a *national* solution.

Understanding the relative influence of these factors on the somewhat tepid response of U.S. residents to collective renewable energy policy efforts would both (1) help one understand the implications of my results for the public goods theory generally, and (2) inform national and state policy debates on the relative merits of collective and voluntary renewable energy programs.

- **Further Explore the Reasons for the Gap Between Hypothetical and Observed Willingness to Pay.** Research reported in this dissertation not only shows that free-riding behavior and preferences for collective payments are not the only reasons for the wide gap between hypothetical statements of willingness to pay and observed experience with green power programs, but also identifies a number of other possible explanations for the weak response to green power programs. Further work will be needed to understand the relative influence of these various factors compared to free-riding incentives and collective payment preferences, and to thereby develop a better framework for understanding the difficulties of marketing a green product.

- **Study the Product Designs, Education Campaigns, and Marketing Tactics that Could Narrow the Gap between Hypothetical and Observed Willingness to Pay.** The fact that free-riding incentives represent just one of many barriers to growing the voluntary green power market might initially be discouraging. Not only do marketers need to overcome individuals' incentives to free ride, but they also need to overcome other barriers to market growth. On the other hand, the fact that 25% of survey respondents in some field research settings actually sign-up to pay an $8 monthly premium for green power, despite the incentive to free-ride, suggests that marketers may be able to overcome some of the barriers with effective consumer education and marketing efforts and with green power products that are looked upon favorably by consumers. If increasing voluntary green power demand is an objective, high priority should be placed on how to increase the typical 1% response to green power programs to the 25% response that is sometimes generated in field research settings; alternatively, understanding why a 25% response is not achievable outside of a field research setting should be given priority. Studying the impact of some of the specific marketing tactics identified in Chapter 3 would be one useful step in this direction, as would be evaluating the impact of different green power product designs.

- **Participation Expectations and the Bandwagon or Reciprocity Effect Should**

be Evaluated Further. Though I highlight the possible importance of "participation expectations" and "bandwagon" or "reciprocity" effects in this and earlier chapters, it must be re-emphasized that much remains to be done to truly understand these effects in a green power setting. As highlighted in Chapter 6, one issue that deserves additional attention is that of causality. Is it because others are expected to contribute that survey respondents also indicate a willingness to pay? Or, do respondents who say they are willing to pay simply "defend" their choice by saying that they believe others would make a similar one? Related, even if there is causality between beliefs about the participation of others and individual choices to purchase renewable energy, how significant is this effect not only in hypothetical survey settings but also in actual choice environments?

- **The Limits of Altruism Among Firms Should be Delineated:** Research presented in this dissertation shows that many of the non-residential customers currently purchasing green power were motivated by altruistic concerns as opposed to the more selfish concerns that are often assumed in economic models. (I also find that traditional "private value" motivations are more prevalent among larger organizations). It must be recognized, however, that my survey sampled a limited set of early adopters of green power. The motivations of these organizations cannot be readily extrapolated to the much larger set of organizations that have not yet purchased green power. In fact, if one assumes that altruism among firms is limited, then non-residential demand for green power may not grow significantly from its currently small base. A worthy area of further research would be to specifically explore the limits to altruistic decision-making among a broader set of firms to better understand how many and what types of organizations can be influenced in this way. Results from such a study would help the green power community better understand the potential and limits of relying on non-residential green power demand.

7.6 Concluding Remarks: The Fate of the Green Power Market

What then does this all mean for the long run fate of the green power market? Are there enough electricity customers whose public orientation matches the public qualities of renewable energy to support a viable green market in a way that will complement public policies? And, in its optimal form, is the green power market worth pursuing?

7.6.1 The Optimistic View

There are some reasons to be optimistic, at least for the long term potential of the green power market. Despite a substantial slow-down in the move towards retail choice and limited green power demand so far, the green power market is still young and the availability of green power products nationally continues to rise, albeit at a slower rate. New renewable energy facilities have already come on line expressly to serve the green power market, and more capacity is planned.

While economists predict that free riding will be a major inhibitor to the growth of this market, a number of marketing tactics might be used to help partially overcome this barrier. And experience with recycling and other environmental behaviors shows that individual environmental action is not always doomed to play a small niche role in environmental improvement. State policymakers, meanwhile, continue to invest time, energy, and cash in the green power market, hoping to stimulate a sustainable and sizable market demand.

Though surveys show that individuals slightly favor collective policy measures, these preferences do not appear to be strong ones, and these surveys also show that a large number of households might be willing to voluntarily pay a premium for green power. Moreover, actual efforts to solicit contributions in a field setting have sometimes engendered contributions from as many as 50% of survey respondents, and more generally 15-25%, well above the current average household penetration rate of 1%. Even some businesses have expressed interest in purchasing green power, with motivations that do not always differ greatly from those of residential households.

It might also be argued that the value of the green markets extends beyond its immediate and measurable support for renewable generation. First, the green power market may offer the renewable energy industries a durable, sustainable market for their products that is not entirely dependent on the whim of government policy. Second, by expanding renewable resource development throughout the U.S., the green power market is giving a broader array of market participants experience with renewable energy, demonstrating to the public the possibilities of renewable energy in their own communities, and in some cases enhancing state and local collective policy efforts. Finally, the marketing efforts of green power providers is educating the public about the environmental impacts of conventional electricity generation and the benefits of renewable energy; such education could be beneficial in creating a political climate conducive to the acceptance of supportive renewable energy policies.

7.6.2 The Pessimistic View

While there are reasons for some optimism, this research must unavoidably leave the reader will a large dose of pessimism as well. Actual response to green power products to date has been modest, with average household penetration rates of just 1% and a maximum of 7%. Green power products (especially those in restructured markets) with few environmental credentials have sometimes been marketed. With nearly 40% of the U.S. populace having access to one or more green power products, participants to date have only helped bring on-line 100 average MW of new renewable capacity, enough to displace just one small natural gas unit and a fraction of what public policy efforts have been able to deliver. Experience with green power programs suggests that this is a market that will be built slowly, not one with immediately strong underlying demand.

Survey responses and economic theory suggest that free riding may be inhibiting customer demand to some extent. As reported in this dissertation, U.S. residents and non-residential green power customers both appear to acknowledge this incentive, and both prefer (modestly, in the case of U.S. residents) collective policy support for renewable energy to reliance on voluntary green power demand. Survey responses also offer some evidence of an upwards bias in hypothetical willingness to pay measures. This dissertation also identifies a number of other explanations for the discrepancy between stated intentions to purchase renewable energy and observed market response. Apparently, if demand for green power is to increase appreciably, not only will the standard economic barrier of free riding stand in the way, but so too will a host of other barriers to voluntary action.

7.6.3 Conclusion

While it remains too early to draw definitive conclusions about the contribution that the green power market might make towards renewable energy development over the long run, results from this dissertation lead to one underlying conclusion: full or even significant reliance on the green power market to meet renewable energy policy objectives would be premature at this time, and there is little evidence that a transition towards voluntary support in the near term will be viable. While the standard economic version of the public goods/free riding theory is found to have some limitations in the present application, and a more complex and nuanced understanding of green product markets is offered in this dissertation, free riding does appear to be an inhibitor to demand growth. So too, however, are a number of other barriers not otherwise emphasized by economic theory. While the green power market may provide modest gains in renewable energy supply, and may offer the ancillary benefit of increased consumer awareness about energy issues, traditional forms of public policy support appear necessary for the commercialization and maturation of the renewable energy industries.

Appendix A

Non-Residential Customer Survey: Competitive Markets

Section 1: Purchasing Green Power

To begin, we would like to ask you about your organization's experience with purchasing a green power product.

Q1. Please indicate how your organization got started with green power. *(Please check appropriate box).*

Our organization was first approached by a green power marketer.

Our organization first approached a green power marketer.

Our organization was first approached by a third party, e.g., a community or environmental group, to purchase green power.

Q2. Please indicate how you selected a green power product. *(Check appropriate box).*

Our organization issued a request for proposals.

Our organization negotiated with one or several green power marketers on price and/or resource content terms.

Our organization selected an off-the-shelf green product offered by a green power marketer and did not negotiate on price and/or resource content terms.

Other ____

Q3. Please indicate how important the following criteria were in your organization's selection of a green power provider (as opposed to an individual *product).*

	Not Important				**Very Important**
Supplier has a good reputation as an electricity provider	1	2	3	4	5
Supplier appears financially sound	1	2	3	4	5
Supplier is a local company	1	2	3	4	5
Supplier is easy to work with and understands our needs	1	2	3	4	5
Supplier appears to be socially responsible and genuinely committed to the environment	1	2	3	4	5

Other: *(please specify)* ____

Q4. How important were the following criteria in your organization's decision to purchase a particular green power *product*. *(Please circle your responses).*

	Not Important				Very Important
Price	1	2	3	4	5
Short contract or commitment length	1	2	3	4	5
Percent of electricity generated using renewable sources	1	2	3	4	5
Type of renewables (wind, biomass, geothermal, solar, etc.)	1	2	3	4	5
Your money will go towards constructing new renewable generation rather than towards the operation of existing facilities	1	2	3	4	5
Renewable generation located in-state rather than out-of-state	1	2	3	4	5
Green product officially certified by a third party or endorsed by an environmental organization	1	2	3	4	5

Other: *(please specify)* ____

Q5. How long did your purchase decision take from your first contact with a green power marketer or third party advocate, to when you actually signed up for green power?

____ a few days____ less than a month ____ months *(write in how many)*

Q6. What is your organization's approximate total expenditure on electricity per year?

$________________/year

Q7. Is green power costing you more, less, or about the same as other available options?

costs more costs less costs about the same

Q8. If green power is costing you more (or less), how much more (or less)?

$_____________/month **or** $_____________/year

Q9. To what extent did energy efficiency savings or other electricity price reductions help you justify purchasing green power? *(Please circle your response)*

Not important 1 2 3 4 5 **Very important**

Q10. What unit within your organization was the *champion* for getting your green power contract signed and implemented?

our environmental department

our marketing or public relations department

our CEO, owner or director

our facilities/energy/procurement department

our parent company

our finance or accounting department

other *(please specify)* ____

Q11. To what extent did the following potential factors complicate your organization's green power purchasing process? *(Please circle your responses).*

	Not at all Problematic				**Very Problematic**
Green Power Provider(s) had difficulty meeting our needs or was otherwise difficult to work with	1	2	3	4	5
State Regulations were a barrier	1	2	3	4	5
Fear of Increased Scrutiny by environmental groups	1	2	3	4	5
Internal Resistance by key decision-makers	1	2	3	4	5
The Extra Cost of green power was a serious hurdle	1	2	3	4	5
Incomplete Information made it difficult to determine the true environmental benefits of green power	1	2	3	4	5

Other *(please specify)*____

Section 2: Why Green Power?

Q12. How important were the following considerations in influencing your organization's decision to purchase green power? *(Please circle your responses).*

	Not Important				Very Important
Lowest Cost: Green power is our cheapest electricity option	1	2	3	4	5
Public Image of Our Organization: Maintaining a "Green" public image is important to us	1	2	3	4	5
Catering to the Environmentally-Conscious: It is important that we accommodate the needs and concerns of our customers, shareholders or constituents	1	2	3	4	5
Organizational Values: Our organization feels a strong and pervasive commitment to public health and the environment	1	2	3	4	5
Civic Responsibility: We feel a responsibility to be community leaders, not just for the environment	1	2	3	4	5
Employee Morale: Employees feel more pride in an organization that is giving back to the environment	1	2	3	4	5
Reduced Risk of Future Regulation: Our voluntary actions in support of renewable energy reduce the need for future government intervention and regulation	1	2	3	4	5

Other *(please specify)*____

Q13. Please indicate the extent to which you believe the following statements about an organization's ability to generate marketing and public relations value from a green power purchase are true. *(Please circle your responses).*

	Definitely True		Somewhat True		Not at all True
Being among the first in our industry or community to purchase green power is an effective way for a company to set itself apart	1	2	3	4	5
Once a large number of companies in an industry or community have done so, it becomes *less worthwhile* for a late adopter to demonstrate its own commitment to the environment by purchasing green power	1	2	3	4	5
Once a large number of companies in an industry or community have done so, it becomes *increasingly important* for a late adopter to demonstrate its own commitment to the environment by purchasing green power	1	2	3	4	5
Whether or not our company purchases green power is entirely unaffected by the activities of other companies in the industry or community	1	2	3	4	5

Q14. What percentage of your product or service sales are to customers whom you believe make a concerted effort to buy green products and services?

less than 1%	5%-10%	20%-50%
1%-5%	10%-20%	over 50%

Section 3: Green Value

Q15. Has your organization engaged in any of the following activities to get the word out about its green power purchase?

	Yes, we have done this	We're planning to do this	No plans to do this
Efforts have been made within our organization to educate employees about green energy			
We have developed point-of-sale marketing or public education material to get the word out to our customers/constituents about our commitment			
Our organization has issued press releases announcing our green power purchase			
We have highlighted our green power purchase in our reports to shareholders, members or funding sources			

Other *(please specify)*____

Q16. Prior to restructuring of the electricity industry, most renewable electricity generation was supported through state and federal programs and policies. Recently, more emphasis is being placed on markets and customer choice. How do you think renewables development should be encouraged? Please indicate your support for the following options.

	Do Not Support				**Strongly Support**
All electricity consumers should pay a little more for their electricity in order to raise funds to finance renewable energy	1	2	3	4	5
All utilities and/or power suppliers should be required to include a minimum percentage of renewable energy in their supply portfolios	1	2	3	4	5
Pollution from electricity generation should be taxed or further regulated	1	2	3	4	5
Support for renewables should come from voluntary consumer choice	1	2	3	4	5

Other *(please specify)*____

Q17. In the event that government required all electricity marketers to include a minimum percentage of renewable energy in their supply portfolios, would your organization be more inclined or less inclined to buy additional green power beyond the government requirement?

Less inclined				More inclined
1	**2**	**3**	**4**	**5**

Section 4: More About You

Q18. How would you classify your organization?

For-Profit Company

Private Non-Profit *(skip to Q21)*

Public Sector *(skip to Q21)*

Q19. As a For-Profit Company, are you primarily involved in:

Primary Industry/Manufacturing/Wholesale Trade

Retail/Services

Q20. As a For-Profit Company, are you:

Publicly Held and Traded

Privately-Owned

Q21. Into which of the following gross annual revenues or annual budget categories does your organization fall?

less than $500,000	$2 m to $10 million	$100 million to $1 billion
$500,000 to $2 million	$10 m to $100 million	more than $1 billion

Q22. Overall, to what extent has your green power purchase provided the benefits that you anticipated?

Not at All				**Completely**
1	2	3	4	5

Q23. When your current green power contract (if any) or commitment term ends, how likely is it that your organization will renew its green power purchase?

Not Very Likely				**Very Likely**
1	2	3	4	5

Finally: If you would like to receive a copy of the paper reporting the results of this survey, please provide your name and contact information below. Or you may check the Website at nationalwind.org in July or August to view a copy.

Organization Name____
Contact Name____
Address__________________City________________ State__ Zip

Please feel free to include any other comments you might have in the space below.

Thank you for your cooperation!

Appendix B

Green Power Marketer Survey

- GREEN POWER MARKETER RESEARCH -

Lawrence Berkeley National Laboratory (LBNL) is conducting an information gathering exercise involving active U.S. green power marketers. This research is intended to both (1) collect information on green power market, industry, and product trends; and (2) explore the impact and importance of market rules and market facilitation efforts in the development of the customer-driven market for green power. For objective (1), the information collected will be used in an aggregated fashion to explore green power trends and market characteristics (i.e., what companies are active, what are their expectations of customer demand and the impact of that demand on renewable energy, what types of marketing strategies are being used, etc.). For objective (2), the research is designed to establish the relative importance of different types of government and regulatory policy on the green power market.

We would like you to take part in this research. We believe that your participation will be worth your time because, as electric industries are restructured, we hope that our research will have a positive influence on regulators and legislators that are struggling with the design of market rules. Your cooperation is, of course, voluntary, but is vital to this research. All of the information that we obtain from you during the research will be kept strictly confidential. We will not disclose your specific answers to the questions to anyone. We may note that your company has participated in the research, but we do not intend to disclose your name or your company's name with reference to any of your responses to the questions listed below. All data will be aggregated before publication. Nonetheless, if any individual question is too sensitive, feel free to ignore it and move on to less sensitive parts of the questionnaire. Please also feel free to expand on your answers if you wish and attach the longer discussion.

*Please return the completed questionnaire to LBNL by **February 12, 1998** in the envelope provided or via fax. Thank you in advance for your participation.*

COMPANY BACKGROUND

1. Company Name and Division:_________________

2. Contact Person *(optional)*:_____________________

3. Job Title: _________________________________

4. How do you classify your business:

   a. Is your company (1) a wholesaler of green power, (2) a retailer of green power, or (3) both a wholesaler and retailer of green power? *(circle one)*

   b. Does or will your company (1) only sell "green" electricity products or (2) do you have a product line that includes non-green electricity products? *(circle one)*

   c. Is your company affiliated with a regulated electric utility? ____*yes*, ____ *no*

   d. To meet the demand of your green power customers, does or will your company: (1) own generation resources; (2) purchase power from specific generators via contract; and/or (3) purchase bundled electricity products from wholesalers? *(please circle all that apply)*

5. In what regions of the country are you or do you intend to sell green power?

MARKET RULES AND MARKET FACILITATION EFFORTS

6. The ultimate success of the competitive market for electricity services, and the green power market more specifically, may, in part, depend on the detailed market rules established at the onset of restructuring (e.g., unbundling of billing services, fuel source disclosure, stranded cost recovery, etc.). In the following regions in which you are active, what market rules have been established or are being considered that you believe will act as **significant barriers** to the development of the customer-driven green power market (or the competitive market for electricity services more broadly)?

   a. Market Rules in California

   b. Market Rules in New England

   c. Market Rules in Pennsylvania

d. Market Rules in Other Regions *(please specify)*

7. A number of market barriers exist that could thwart the development of the customer-driven green power market. Of the potential market barriers listed below, please circle the five barriers you consider to be most serious in terms of their potentially negative impact on your business: *(please circle the five most serious barriers)*

   a. lack of customer education on retail choice
   b. market power of electric utilities and their affiliates
   c. low cost of utility default service
   d. stranded cost recovery
   e. transmission pricing, ancillary services, and bidding rules that penalize intermittent, low capacity factor, distant renewable generators
   f. lack of customer education on renewable energy
   g. barriers to aggregation of electricity consumers based on geography or affinity
   h. lack of existing renewable energy plants that are able to sell to marketers due to contract restrictions
   i. no mandatory fuel source and/or emissions disclosure
   j. power pooling structures that do not allow direct bilateral contracts (but do allow contracts-for-differences and other financial contracts)
   k. insufficient unbundling of revenue-cycle services (metering, billing, etc.)
   l. lack of sufficient customer protection regulations
   m. protracted direct access phase-ins that favor larger customers
   n. direct access processing and service fees that erect barriers for new participants (via high costs, slowness, lack of parity between marketers and utilities, etc)
   o. insufficient definition(s) of green power

8. To the extent that you perceive stranded cost recovery as a potential barrier to the development of a competitive electricity market, how would you design stranded cost recovery to mitigate that barrier?

9. Of the following types of market structure, which would you prefer? *(please circle one)*

   Biltateral trade POOLCO POOLCO plus bilateral trade

   Why do you prefer this form of market structure?

10. The ultimate success of the competitive market for electricity services, and the green power market more specifically, may, in part, depend on the detailed market rules established at the onset of restructuring. Below is a list of possible market rules that would likely impact **all electricity marketers**. Many of these rules may be important to your business. However, please rank each on a scale of 1 to 5, where "1" means that your company believes that the rule is **"valuable"** (but far from essential) and "5" means that your company believes that the rule is **"essential"** (note that we've also included a box if your company would be **"opposed"** to a specific rule)? *(please check one for each market rule and please look through the entire list before ranking)*

Market Rules Affecting all Marketers	**My company opposes this rule**	**My company believes this rule is "valuable" +1**	**+2**	**+3**	**+4**	**My company believes this rule is "essential" +5**
Customer Information and Protection Issues:						
Establish marketer credit requirements during marketer registration process at PUC						
Funding for broad-based, nondiscriminatory customer education on retail choice						
Establish a code of conduct for all marketers during marketer registration process at PUC						
Independent verification of customer orders to switch electric providers						
Market Power and Structure Issues:						
Utility divestiture of generation assets						
Creation of an independent system operator						
Restrictions on utility affiliate marketing in their parent utility service territory and/or their use of the utility name and logo						
Bilateral trading market structure as opposed to a pooling structure						
Competitive Services and Direct Access Issues:						
Full and fair unbundling of billing services						
Full and fair unbundling of metering services						
Establish default utility service rates that provide sufficient margin to encourage entry of competitive suppliers						
Nondiscriminatory sharing of customer information by incumbent electric utilities						
Allow use of load profiles for smaller residential and commercial customers						
Regulations that require sharing of customers that choose not to switch suppliers (i.e., creation of multiple default service providers)						

Market Rules Affecting all Marketers (continued)	My company opposes this rule	My company believes this rule is "valuable" +1	+2	+3	+4	My company believes this rule is "essential" +5
Minimize charges for noncompetitive services imposed by electric utilities on marketers (e.g., costs for customer switching)						
Parity between marketers and utilities with respect to obligations, rights, and charges for billing, metering, data transfer, service agreements, avoided cost credits, customer contracts, etc.						
Uniformity and consistency across utility service territories for data transfer protocols, direct access service tariffs and agreements, metering and billing requirements, and other rules						
Market Timing Issues:						
Full direct access on a date certain without direct access phase-ins						
Require utilities to rapidly process direct access service requests						
If a direct access phase-in exists, allow residential customers to receive choice on the same schedule as other customer classes						
Stranded Cost Issues:						
Less than 100% recovery of stranded costs						
Establish incentives for stranded cost mitigation by electric utilities						
Require stranded costs to be recovered in a short period of time						
Recover stranded costs via a stable cents/kWh charge, not a charge that depends inversely on the power exchange clearing price						
Other (please specify)						

11. Again, the ultimate success of the green power market may, in part, depend on the detailed market rules established at the onset of restructuring as well as governmental and private efforts to help facilitate the development of the green power market. Below is a list of possible market rules and facilitation efforts that would likely **differentially** impact green power marketers relative to other electricity marketers. Many of these rules and facilitation may be important to your business. However, please rank each on a scale of 1 to 5, where "1" means that your company believes that the rule or facilitation effort is **"valuable"** (but far from essential) and "5" means that your company believes that the rule or facilitation effort is **"essential"** (note that we've also included a box if your company would be **"opposed"** to a specific rule or facilitation effort)? *(please check one for each market rule and facilitation effort, and please look through the entire list before ranking)*

Market Rules and Facilitation Efforts that Differentially Affect Green Power Marketers	My company opposes this rule	My company believes this rule or facilitation effort is "valuable" +1	+2	+3	+4	My company believes this rule or facilitation effort is "essential" +5
Market Rules:						
Mandatory disclosure of fuel mix, emissions, and/or pricing and contract terms information						
Incentives for the restructuring and buy-out of existing renewable energy qualifying facility (QF) contracts						
Creation of a renewables-only power pool						
ISO/bidding rules that do not penalize intermittent generators and small generators						
Transmission pricing rules that do not penalize intermittent, low capacity factor generators						
Transmission pricing rules that do not penalize generators located far from load						
Ancillary service costs that do not penalize intermittent, low capacity factor generators						
Fair payment to generators that provide T&D support benefits (e.g., local PV)						
Removal of barriers to geography- and affinity-based aggregation of customers						
Allow local governments to act as default service providers without a positive declaration by each customer (customers could opt out)						
Direct Green Power Marketing Facilitation Efforts:						
If a direct access phase-in exists, allow immediate access for all customers that are willing to purchase a certain percentage of renewable energy						
Allow customers to make renewables contributions or purchases through their default service provider						
Product or company endorsements by environmental groups						
Monetary production incentives or rebates to customers that purchase green power						
Reduced direct access service fees for customers switching to a green power provider						
Expansion of FTC green marketing guidelines to green power marketing						
State-level (PUC or legislative) definition of "green" power						

Market Rules and Facilitation Efforts that Differentially Affect Green Power Marketers (continued)	**My company opposes this rule**	**My company believes this rule or facilitation effort is "valuable" +1**	**+2**	**+3**	**+4**	**My company believes this rule or facilitation effort is "essential" +5**
Publicly-funded education on renewable energy and green power products						
Third-party certification of green power products						
Government purchases of green power						
Broader Renewable Energy Policies:						
Net metering of customer-sited renewable energy facilities						
Renewable energy project siting and permitting procedures that allow for more rapid construction of renewable projects						
Tax or financial production incentives and/or low interest loans to renewable energy generators						
Establishment of state or federal renewables portfolio standards						
Other (please specify)						

12. On a scale of 1 to 5, with "1" being not at all important and "5" being extremely important, how important overall are the detailed market rules and facilitation established at the onset of restructuring likely to be in determining the success of customer driven market for green power? ________ *(rank 1-5)*

13. Do you believe that regulators and legislators have or are adequately considering the impact of these detailed market rules and facilitation efforts on the customer-driven market for green power?

    ______ *yes*, ______*no*

14. Disclosure Questions:

    a. Do you believe that some form of mandatory disclosure is critical for fostering informed customer choice? ______*yes*, ______ *no*

    b. On a scale of 1 to 5, with "1" being not at all important and "5" being extremely important, how important are each of the following types of disclosure in expanding the customer-driven market for green power?

    air emissions disclosure ______ *(rank, 1-5)*
    price and contract terms disclosure ______ *(rank, 1-5)*
    fuel source disclosure ______ *(rank, 1-5)*

c. If fuel source disclosure was **required**, would you prefer? *(please circle one)*

i. disclosure for all marketers
ii. claims-based disclosure with default values for those that do not make claims (i.e., marketers that do not make claims report system average)
iii. claims-based disclosure without default values for those that do not make claims (i.e., marketers that do not make claims do not report anything)

d. If fuel source disclosure was **required**, would you prefer it be based on? *(please circle one)*

an ISO settlement system   tradeable tags

e. If fuel source disclosure was **required**, would you prefer it be based on? *(please circle one)*

historic data   projected data   both historic and projected data

f. If fuel source disclosure was **required**, would you prefer it be based on? *(please circle one)*

the company   the product   both the company and the product

g. If fuel source, air emissions, and/or pricing and contract terms disclosure was **required**, would you prefer? *(please circle one)*

standardized format   non-standardized format

15. Certification Questions

a. On a scale of 1 to 5, with "1" being not at all important and "5" being extremely important, how important is it for your business that a certification program for green power is available? _____ *(rank 1-5)*

b. Would you prefer: (1) a certification program that was run by a nonprofit group allied with environment and consumer interests or (2) a government-administered certification effort? *(please circle one)* Why?

c. If you supply green power in California, have any of your products been certified by the Green-e program? ______ *yes,* ______ *no.* If "yes,"

Has the Green-e program helped you define your green power products and marketing strategies? _____*yes,* _____*no*

How has the Green-e changed your product offers and marketing strategies?

THE MARKET

16. Approximately what percent of customers in each category do you believe will select a new electricity supplier (**whether green or not**) once retail competition is introduced? *(Please insert percentages)*

    a. 1 year after retail competition is introduced:

    Residential_____ Commercial______ Industrial______ Government______

    b. 5 years after retail competition is introduced:

    Residential_____ Commercial______ Industrial______ Government______

17. Of those customers that select a new electricity supplier, approximately what percentage in each category do you think will select a product that contains at least 20% non-hydro renewable electricity (i.e., solar, wind, biomass, geothermal)? *(Please insert percentages--recognize that these are percentages of those customers that are expected to switch suppliers)*

    a. 1 year after retail competition is introduced:

    Residential_____ Commercial______ Industrial______ Government______

    b. 5 years after retail competition is introduced:

    Residential_____ Commercial______ Industrial______ Government______

18. On a scale of 1 to 5, how important do you believe each of the following product and company related factors are in successfully marketing your green power products to residential customers? *(please check one for each factor)*

Factors in successfully marketing green power to residential customers	**Not at all important 1**	**2**	**3**	**4**	**Extremely important 5**
selling price of product					
company recognition and brand identification					
renewable energy content of product					
recognized corporate environmental commitment of marketer					
air emissions of product					
effectiveness of product-related advertising					
credibility of the company's message					
inclusion of "new" renewable energy projects					
perceived reliability of power supply					

exclusion of nuclear and coal power					
customer-sited renewable energy applications (PV, wind, etc.)					
incentives and bonuses for customer sign-up and participation (e.g., rebates, gifts, etc.)					
offers of additional ancillary products and services for a fee (i.e., billing and payment options, efficiency services, etc.)					
Other (please specify)					

19. Approximately what percent of the revenue that you expect to obtain from your customer-driven green power business do you think will come from the following market segments: residential customers____ *(%)*, commercial customers ____*(%)*, industrial customers___*(%)*, government customers____*(%)*, retailers, resellers and aggregators____*(%)*

20. Of the following types of advertising that your company might use for your green power products during the early years of restructuring, please rank the top three in terms of total expected annual cost? (*Please rank from most costly, 1, to least costly, 3)*

    _____direct mail to customers
    _____TV spots
    _____radio spots
    _____print ads
    _____telemarketing
    _____direct communication with retailer, resellers and/or aggregators
    _____other *(please specify)*

21. Taking into account all costs, approximately how much do you expect to spend on average in order to sign-up an individual residential customer for one of your green power products in the **first year** of retail competition? *(please circle one-- wholesalers may ignore this question)*

    Less than $10
    $10-30
    $30-50
    $50-100
    $100-200
    more than $200

22. If you have signed or expect to sign contracts with **new** non-hydro renewable energy generators (i.e., solar, wind, biomass, geothermal), approximately what length of contract do you expect to provide to these generators over the next 2 years?______ *(years)* In 5 years? ______*(years)*

23. If you have signed or expect to sign contracts with **existing** non-hydro renewable energy generators (i.e., solar, wind, biomass, geothermal), approximately what length of contract do you expect to provide to these generators over the next 2 years?______ *(years)* In 5 years? ____*(years)*

THANK YOU!

Please return the questionnaire to Ryan Wiser or Steve Pickle at:
Lawrence Berkeley National Laboratory
1 Cyclotron Rd., MS 90-4000, Berkeley, CA 94720
Or fax it to: 510/486-6996

Appendix C

Contact Letters for Contingent Valuation and Opinion Surveys

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DATE

Dear Sir or Madam:

A few days from now you will receive in the mail a brief questionnaire to fill out for an important research project being conducted by the University of California at Berkeley.

The study concerns your opinions on some of the important energy and environmental issues currently facing the nation. We know you are very busy and have opted to send you a mail survey that you can fill out at your convenience rather than call you on the phone to ask you questions. We are writing in advance because we have found that many people like to know ahead of time that they will be contacted.

This is an important study, and the information you provide will be used to help shape future energy policy. Whether or not you know much about energy, and whether or not you are very concerned about the environment, your answers are important!

We have hired PA Consulting Group, an independent research firm, to administer the survey on behalf of the University of California. They will ensure that your responses are kept completely confidential.

Thank you in advance for your help with this important effort. It is only with the generous help of people like you that our research can be successful.

Sincerely,

Ryan Wiser

Ryan Wiser

Project Leader
University of California at Berkeley

P.S. We will be enclosing a small token of our appreciation with the questionnaire as a way of saying thanks.

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DATE
Dear Sir or Madam:

We are writing to ask for your help in a study that is being sponsored by the University of California at Berkeley. The study concerns your opinions on some of the most important energy and environmental issues facing the nation.

You are part of a small group of individuals that were randomly selected to represent the views of all Americans. Whether or not you know much about energy, and whether or not you are very concerned about the environment, your answers to the enclosed survey are vitally important!

Results from the survey will be used to help shape future policy in the United States. In particular, because of changes in the electric utility industry, the nation is faced with a decision about whether to support renewable energy sources (such as wind power and solar energy) in the future. However, little is known about what people think about this issue. Only by asking people throughout the country to give their honest opinions can we incorporate those opinions into national policy decisions.

You can be assured of complete confidentiality. Your name will never be associated with the study's findings. When you have completed the questionnaire, your name will be deleted from the mailing list and never connected to your answers in any way. We have hired PA Consulting Group, an independent research firm, to administer the survey on behalf of the University of California. They will ensure that your responses are kept completely confidential.

If you have any questions about the study's purpose, please feel free to call me at the University of California at (510) 486-5474. If you have any questions about the survey booklet, please call Kimberly Bakalars at PA Consulting Group toll-free at 1-800-935-4277.

Thank you in advance for your help with this important study.

Sincerely,

Ryan Wiser

Ryan Wiser
Project Leader
University of California at Berkeley

P.S. Please accept the enclosed $1 as a token of our appreciation for your help.

Dear Sir or Madam:

A few days ago you should have received a short survey asking your opinions about important energy and environmental issues currently facing the nation. You are part of a small group of individuals randomly selected to receive this survey.

If you have already filled out and returned the questionnaire to us, please accept our sincere thanks. If not, we hope you will take a moment to complete and return the survey today. It is extremely important that we hear from you because your responses will help shape future energy policy in the United States.

If you did not receive the questionnaire, or if it was misplaced, please call Kimberly Bakalars at PA Consulting Group toll-free at 1-800-935-4277 and she will get another one in the mail to you today. We are hoping to hear from you soon. Your contribution to the success of this study will be greatly appreciated!

Ryan Wiser
University of California at Berkeley

c/o PA Consulting Group, 2711 Allen Boulevard, Suite 200, Middleton, WI 53562

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DATE

Dear Sir or Madam:

We are sorry to bother you again, but it is important to hear from you. A few weeks ago we sent you a survey asking what you think about critical energy and environmental issues facing the nation.

We believe it is important that people's opinions towards energy and environmental issues be incorporated into national policy decisions. Good decisions about energy policy can only be made if we know how people like you will be affected.

We are sending you another copy of the questionnaire because of our concern that people who have not responded may have different opinions than those who have. To get a good understanding of the range of opinions about the issues, we must hear from as many people as possible. Regardless of whether or not you know much about energy issues, and whether or not you are very concerned about the environment, it is important that we hear your opinions.

We also want to assure you that your responses to this survey will be kept strictly confidential and that your name will never be revealed to anyone. Information from the survey will be reported only in statistical terms. The identification number on the back of the survey is used only for tracking purposes so we can avoid re-contacting those people who have already completed the survey. Because your response is so important, we are enclosing another copy of the survey and a postage-paid, self-addressed envelope for your convenience. If for some reason you can't complete the survey, please write us a note on your survey booklet and return it.

If you have any questions about the purpose of the study or its use, please feel free to call me at the University of California at Berkeley at (510) 486-5474. If you have any questions about the survey booklet, please call Kimberly Bakalars at PA Consulting Group toll-free at 1-800-935-4277.

Sincerely,

Ryan Wiser
Project Leader
University of California at Berkeley

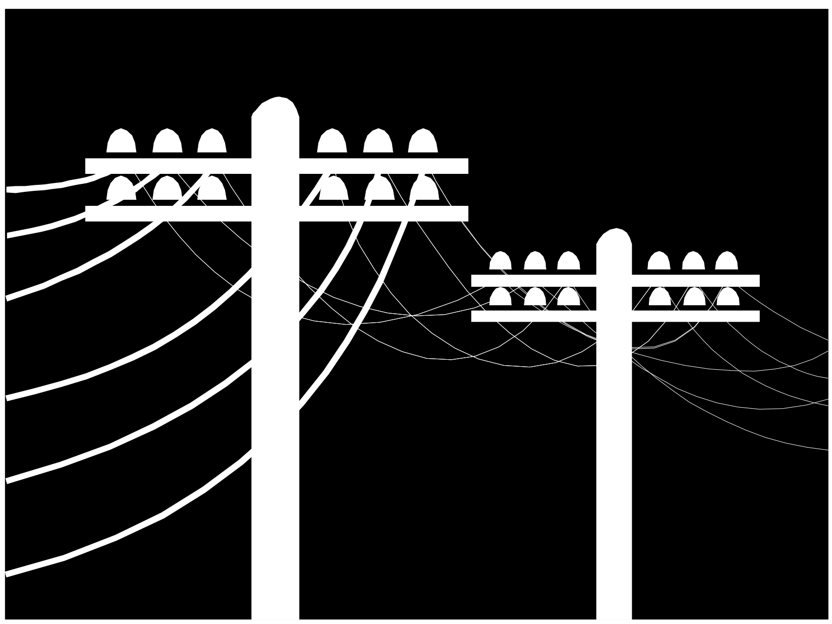
Appendix D

Sample Contingent Valuation Surveys

SCENARIO 1: 50 CENTS/MONTH BID LEVEL

Deciding Our Energy Future:

Choices for Electricity Supply Survey



University of California at Berkeley

Section 1: Energy Issues Facing the United States

To begin, we would like to ask you some questions about yourself and about your feelings on the electricity industry and on renewable energy.

1. Do you own or rent your residence? *(please circle one number)*

1 Own
2 Rent, lease or other arrangement

2. Does your household pay its own electricity bill? *(please circle one number)*

1 No ☛ Please STOP HERE and return the survey. Thank you for your participation!
2 Yes ☛ Please GO TO QUESTION 3 and continue with this survey

3. Households in some states now have the option of choosing which company will provide their electricity (much like choosing a new long-distance telephone provider). Does your household have the option of choosing your electric company? *(please circle one number)*

1 No
2 Yes
3 Don't know

4. In meeting the nation's overall electricity needs, please indicate how important each of the following issues is to you. *(please circle one number for each issue)*

	not at all important				**extremely important**
Ensuring that electricity service is reliable	1	2	3	4	5
Increasing the amount of electricity generated from renewable sources (such as wind and solar)	1	2	3	4	5
Minimizing the cost of electricity to consumers	1	2	3	4	5
Increasing investments in energy efficiency	1	2	3	4	5
Improving the quality of customer service	1	2	3	4	5

5. **Electricity can be generated from many sources. In the United States, about 57% of our electricity comes from coal and oil, 22% from nuclear, 11% from natural gas, 8% from hydropower, and 2% from renewable energy. Even though producing electricity is less damaging to the environment than it used to be, electricity production still contributes significantly to urban smog, acid rain, and global warming. How much do you know about the environmental impacts of electricity production?** *(please circle one number)*

nothing				**a lot**
1	2	3	4	5

6. **There are several ways to reduce the environmental impacts of electricity production. Please indicate how important each of the following three approaches is to you.** *(please circle one number for each approach)*

	not at all important				**extremely important**
Energy Efficiency – reducing electricity use in homes and businesses by installing energy saving appliances and other measures	1	2	3	4	5
Pollution Control – reducing pollution at natural gas and coal plants by installing filters and other pollution control technologies	1	2	3	4	5
Renewable Energy – producing electricity with wind turbines, solar power, geothermal (heat from under the earth), and biomass (using wood and agricultural wastes to produce electricity)	1	2	3	4	5

7. **About 2% of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal, and biomass. Even though renewable energy often costs more than other ways of producing electricity, renewable energy has some benefits. How important to you are each of the possible benefits listed below?** *(please circle one number for each statement)*

How important is it to you that using renewable energy…	**not at all important**				**extremely important**
…may be less threatening to the environment than other ways of producing electricity	1	2	3	4	5
…reduces our dependence on any one type of electricity generation	1	2	3	4	5
…stimulates new technologies	1	2	3	4	5
…preserves the amount of natural gas and coal available for future generations	1	2	3	4	5
…can create new jobs	1	2	3	4	5

8. **There are also some possible drawbacks to using renewable energy. How worried are you about each of the possible drawbacks listed below?** *(please circle one number for each statement)*

How worried are you that renewable energy…	**not at all worried**				**extremely worried**
…could be more costly than other ways of reducing pollution	1	2	3	4	5
…may not be abundant enough for widespread use	1	2	3	4	5
…already receives too many subsidies	1	2	3	4	5
…could have some environmental drawbacks	1	2	3	4	5
…may not be available when we need it because the supply of some types of renewable energy can depend on the weather	1	2	3	4	5

Section 2: Paying for Renewable Energy

The federal government is considering whether and how to support renewable energy in the future. The University of California is conducting this independent survey to help the country make these important choices.

The next questions are intended to find out whether households are willing to pay for renewable energy. Answers to these questions will be used to shape future policy, so we ask you to take some time in your response. <u>There are no right or wrong answers to these questions.</u> We want to know <u>your</u> preferences.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities. Keep in mind that increasing the supply of renewable energy is one of several ways to reduce the environmental impacts of electricity production.

10. The federal government is considering a program where all homes and businesses in the United States would be <u>required to pay a $0.50 surcharge</u> on their monthly electricity bills for 3 years to increase the supply of renewable energy. This surcharge will be collected by the <u>government</u> and used to help fund the construction of more renewable energy projects. Because the proposed surcharge is mandatory, all homes and businesses will be required to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $0.50/month for 3 years will provide the same environmental benefits as not driving a car a total of 12,000 miles. Because every home and business would be required to pay this surcharge, renewable energy production in the United States would increase from 2% to 3%.

Remembering that all homes and businesses in the United States will have to pay the same amount if this policy is adopted, would your household support the adoption of this proposed monthly surcharge of $0.50 for 3 years (equal to $6 per year and $18 over the life of the program)? *(please circle one number)*

1 No ☛ GO TO QUESTION 10
2 Yes ☛ GO TO QUESTION 11

11. **(If no) There are many reasons why households may not be willing to support the adoption of this required surcharge. Of the possible reasons listed below, please circle <u>all that apply</u> to you and your household.** *(please circle ALL that apply)*

    1 My household can't afford to pay this much for renewable energy
    2 The benefits of renewable energy aren't great enough to warrant the surcharge
    3 Renewable energy should be supported, but I think households should be able to voluntarily pay for renewable energy and that it shouldn't be required
    4 Renewable energy should be supported, but I wouldn't trust the government to effectively spend the funds collected by the surcharge
    5 I am opposed to all new government programs
    6 I object to these types of questions
    7 I would need more information before making a decision
    8 Other *(Please Specify)*________________________________

    ☛ GO TO QUESTION 12

12. **(If yes) We know that some people are more certain than others about their answers. On a scale of 1 to 5, where 1 means "very uncertain" and 5 means "very certain," how certain are you that your household would support the adoption of this required $0.50 monthly surcharge?** *(please circle one number)*

very uncertain				**very certain**
1	2	3	4	5

13. **Remembering that all homes and businesses in the United States would have to pay the same amount if this policy was adopted, what percent of <u>all U.S. residents</u> do you believe would support the adoption of this required $0.50 monthly surcharge?** *(please circle one number)*

    1 less than 10% of residents
    2 10% to 19% of residents
    3 20% to 29% of residents
    4 30% to 39% of residents
    5 40% to 49% of residents
    6 50% to 59% of residents
    7 60% to 69% of residents
    8 70% to 79% of residents
    9 80% to 89% of residents
    10 90% to 100% of residents

Section 3: Your Attitudes about Environmental Issues

14. Please indicate how strongly you disagree or agree with each of the following statements. *(please circle one number for each statement)*

	strongly disagree	somewhat disagree	neutral	somewhat agree	strongly agree
I am often one of the first people I know to try new products	1	2	3	4	5
There is not much that any one individual can do about the environment	1	2	3	4	5
I am more likely to buy environmentally friendly products if I know that other people are doing the same	1	2	3	4	5
I don't trust the environmental claims of companies offering environmentally friendly products	1	2	3	4	5
I don't trust other people to make personal sacrifices to protect the environment	1	2	3	4	5
Now that companies are offering environmentally friendly products, we don't need as many environmental regulations	1	2	3	4	5
The government can't be trusted to collect funds and spend them on worthwhile causes	1	2	3	4	5
The government should require everyone to help pay for environmental improvements	1	2	3	4	5
I will only pay more for environmentally friendly products if I receive a direct benefit from doing so	1	2	3	4	5
I think my family and friends would support renewable energy if they had the option	1	2	3	4	5

15. Which of the following actions do you and your household do on a regular basis? *(please circle ALL that apply)*

1 Try to buy products that are environmentally friendly
2 Pay more for products that are environmentally friendly
3 Recycle newspaper, metals, plastics, or glass
4 Purchase organic foods
5 Reduce energy use in the home
6 Walk, ride a bike, carpool, or take mass transit to help the environment
7 Donate money to environmental causes
8 Volunteer time to environmental causes
9 Invest money in companies that are socially responsible
10 Write letters to politicians about environmental issues
11 Weigh candidates' environmental records when deciding who to vote for

16. How much do you think individuals like yourself can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

17. How much do you think government programs and regulations can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

Section 4: About You

These last few questions will help us understand how well you and other respondents to the survey represent all U.S. residents. All the information in this section (and the entire survey booklet) is confidential. Your name will never be associated with your answers to these questions.

18. How old are you? *(please circle one number)*

1 17 years or under
2 18 to 24 years
3 25 to 34 years
4 35 to 44 years
5 45 to 54 years
6 55 to 64 years
7 65 years and over

19. Are you male or female? *(please circle one number)*

1 Male
2 Female

20. Do you have children? *(please circle one number)*

1 Yes
2 No

21. What is the highest grade or year of school that you have completed? *(please circle one number)*

1 No school
2 Grade school (1-8 years)
3 Some high school (9-11 years)
4 Completed high school (12 years)
5 Some college but no degree (13-15 years)
6 Associate degree
7 Bachelor's degree
8 Post graduate

22. Regardless of your party identification, how would you rate yourself politically? *(please circle one number)*

1 Very conservative
2 Somewhat conservative
3 Neither conservative nor liberal
4 Somewhat liberal
5 Very liberal

23. Below is a list of household income categories. Which income category best describes the combined year 2000 income of you and all adult family members living with you, before taxes? *(please circle one number)*

1 Less than $10,000
2 $10,000 - $19,999
3 $20,000 - $29,999
4 $30,000 - $39,999
5 $40,000 - $49,999
6 $50,000 - $59,999
7 $60,000 - $69,999
8 $70,000 - $79,999
9 $80,000 - $89,999
10 $90,000 - $99,999
11 $100,000 - $149,999
12 $150,000 or more

Thank you for your cooperation!

Your assistance in answering this survey is very much appreciated.

If we have overlooked something or if you have anything else to tell us,
please feel free to do so in the space below.

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2711 Allen Boulevard, Suite 200
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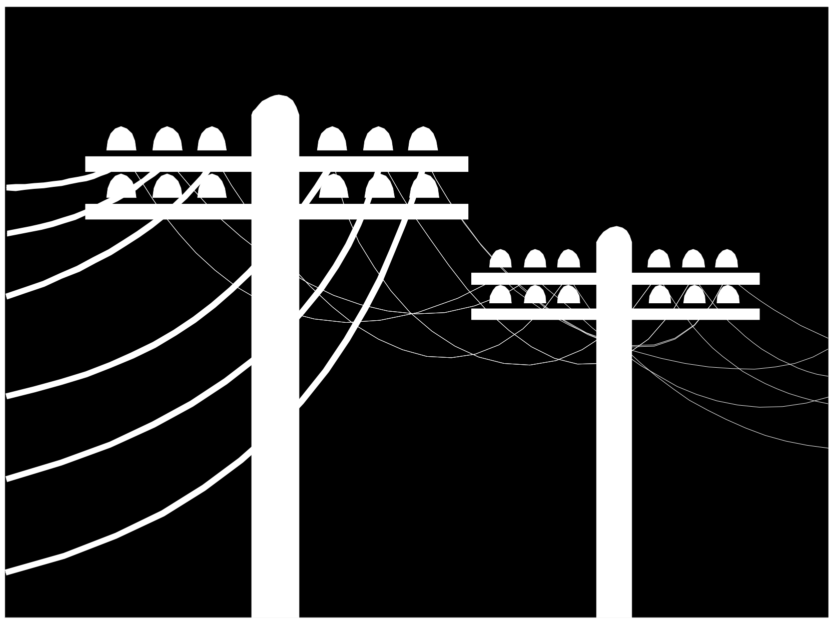
www.are.berkeley.edu/CESS

SCENARIO 2: $3/MONTH BID LEVEL

Deciding Our Energy Future:

Choices for Electricity Supply Survey



University of California at Berkeley

Section 1: Energy Issues Facing the United States

To begin, we would like to ask you some questions about yourself and about your feelings on the electricity industry and on renewable energy.

1. Do you own or rent your residence? *(please circle one number)*

1 Own
2 Rent, lease or other arrangement

2. Does your household pay its own electricity bill? *(please circle one number)*

1 No ☛ Please STOP HERE and return the survey. Thank you for your participation!
2 Yes ☛ Please GO TO QUESTION 3 and continue with this survey

3. Households in some states now have the option of choosing which company will provide their electricity (much like choosing a new long-distance telephone provider). Does your household have the option of choosing your electric company? *(please circle one number)*

1 No
2 Yes
3 Don't know

4. In meeting the nation's overall electricity needs, please indicate how important each of the following issues is to you. *(please circle one number for each issue)*

	not at all important				**extremely important**
Ensuring that electricity service is reliable	1	2	3	4	5
Increasing the amount of electricity generated from renewable sources (such as wind and solar)	1	2	3	4	5
Minimizing the cost of electricity to consumers	1	2	3	4	5
Increasing investments in energy efficiency	1	2	3	4	5
Improving the quality of customer service	1	2	3	4	5

5. **Electricity can be generated from many sources. In the United States, about 57% of our electricity comes from coal and oil, 22% from nuclear, 11% from natural gas, 8% from hydropower, and 2% from renewable energy. Even though producing electricity is less damaging to the environment than it used to be, electricity production still contributes significantly to urban smog, acid rain, and global warming. How much do you know about the environmental impacts of electricity production?** *(please circle one number)*

nothing				**a lot**
1	2	3	4	5

6. **There are several ways to reduce the environmental impacts of electricity production. Please indicate how important each of the following three approaches is to you.** *(please circle one number for each approach)*

	not at all important				**extremely important**
Energy Efficiency – reducing electricity use in homes and businesses by installing energy saving appliances and other measures	1	2	3	4	5
Pollution Control – reducing pollution at natural gas and coal plants by installing filters and other pollution control technologies	1	2	3	4	5
Renewable Energy – producing electricity with wind turbines, solar power, geothermal (heat from under the earth), and biomass (using wood and agricultural wastes to produce electricity)	1	2	3	4	5

7. **About 2% of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal, and biomass. Even though renewable energy often costs more than other ways of producing electricity, renewable energy has some benefits. How important to you are each of the possible benefits listed below?** *(please circle one number for each statement)*

How important is it to you that using renewable energy…	**not at all important**				**extremely important**
…may be less threatening to the environment than other ways of producing electricity	1	2	3	4	5
…reduces our dependence on any one type of electricity generation	1	2	3	4	5
…stimulates new technologies	1	2	3	4	5
…preserves the amount of natural gas and coal available for future generations	1	2	3	4	5
…can create new jobs	1	2	3	4	5

8. **There are also some possible drawbacks to using renewable energy. How worried are you about each of the possible drawbacks listed below?** *(please circle one number for each statement)*

How worried are you that renewable energy…	**not at all worried**				**extremely worried**
…could be more costly than other ways of reducing pollution	1	2	3	4	5
…may not be abundant enough for widespread use	1	2	3	4	5
…already receives too many subsidies	1	2	3	4	5
…could have some environmental drawbacks	1	2	3	4	5
…may not be available when we need it because the supply of some types of renewable energy can depend on the weather	1	2	3	4	5

Section 2: Paying for Renewable Energy

The federal government is considering whether and how to support renewable energy in the future. The University of California is conducting this independent survey to help the country make these important choices.

The next questions are intended to find out whether households are willing to pay for renewable energy. Answers to these questions will be used to shape future policy, so we ask you to take some time in your response. <u>There are no right or wrong answers to these questions.</u> We want to know <u>your</u> preferences.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities. Keep in mind that increasing the supply of renewable energy is one of several ways to reduce the environmental impacts of electricity production.

9. The federal government is considering a program where all homes and businesses in the United States would be given the opportunity to <u>voluntarily pay a $3 surcharge</u> on their monthly electricity bills for 3 years to increase the supply of renewable energy. This surcharge will be collected by the <u>government</u> and used to help fund the construction of more renewable energy projects. Because the proposed surcharge is voluntary, many homes and businesses may decide not to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $3/month for 3 years will provide the same environmental benefits as not driving a car a total of 72,000 miles. If every home and business were to pay this surcharge, renewable energy production in the United States would increase from 2% to 8%.

Remembering that all homes and businesses in the United States will be able to individually decide whether to contribute and that many homes and businesses may decide not to pay, would your household volunteer to pay this proposed monthly surcharge of $3 for 3 years (equal to $36 per year and $108 over the life of the program)? *(please circle one number)*

1 No ☞ GO TO QUESTION 10
2 Yes ☞ GO TO QUESTION 11

10. (If no) There are many reasons why households may not be willing to pay this voluntary surcharge. Of the possible reasons listed below, please circle <u>all that apply</u> to you and your household. *(please circle ALL that apply)*

1 My household can't afford to pay this much for renewable energy
2 The benefits of renewable energy aren't great enough to warrant the surcharge
3 Renewable energy should be supported, but I think all households should be required to pay and that it shouldn't be voluntary
4 Renewable energy should be supported, but I wouldn't trust the government to effectively spend the funds collected by the surcharge
5 I am opposed to all new government programs
6 I object to these types of questions
7 I would need more information before making a decision
8 Other *(Please Specify)*____

✒ GO TO QUESTION 12

11. (If yes) We know that some people are more certain than others about their answers. On a scale of 1 to 5, where 1 means "very uncertain" and 5 means "very certain," how certain are you that your household would volunteer to pay this $3 monthly surcharge? *(please circle one number)*

very uncertain				**very certain**
1	2	3	4	5

12. Remembering that all homes and businesses in the United States would be able to individually decide whether to contribute, what percent of <u>all U.S. residents</u> do you believe would voluntarily pay this $3 monthly surcharge? *(please circle one number)*

1 less than 10% of residents
2 10% to 19% of residents
3 20% to 29% of residents
4 30% to 39% of residents
5 40% to 49% of residents
6 50% to 59% of residents
7 60% to 69% of residents
8 70% to 79% of residents
9 80% to 89% of residents
10 0% to 100% of residents

Section 3: Your Attitudes about Environmental Issues

13. Please indicate how strongly you disagree or agree with each of the following statements. *(please circle one number for each statement)*

	strongly disagree	somewhat disagree	neutral	somewhat agree	strongly agree
I am often one of the first people I know to try new products	1	2	3	4	5
There is not much that any one individual can do about the environment	1	2	3	4	5
I am more likely to buy environmentally friendly products if I know that other people are doing the same	1	2	3	4	5
I don't trust the environmental claims of companies offering environmentally friendly products	1	2	3	4	5
I don't trust other people to make personal sacrifices to protect the environment	1	2	3	4	5
Now that companies are offering environmentally friendly products, we don't need as many environmental regulations	1	2	3	4	5
The government can't be trusted to collect funds and spend them on worthwhile causes	1	2	3	4	5
The government should require everyone to help pay for environmental improvements	1	2	3	4	5
I will only pay more for environmentally friendly products if I receive a direct benefit from doing so	1	2	3	4	5
I think my family and friends would support renewable energy if they had the option	1	2	3	4	5

14. Which of the following actions do you and your household do on a regular basis? *(please circle ALL that apply)*

1 Try to buy products that are environmentally friendly
2 Pay more for products that are environmentally friendly
3 Recycle newspaper, metals, plastics, or glass
4 Purchase organic foods
5 Reduce energy use in the home
6 Walk, ride a bike, carpool, or take mass transit to help the environment
7 Donate money to environmental causes
8 Volunteer time to environmental causes
9 Invest money in companies that are socially responsible
10 Write letters to politicians about environmental issues
11 Weigh candidates' environmental records when deciding who to vote for

15. How much do you think individuals like yourself can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

16. How much do you think government programs and regulations can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

Section 4: About You

These last few questions will help us understand how well you and other respondents to the survey represent all U.S. residents. All the information in this section (and the entire survey booklet) is confidential. Your name will never be associated with your answers to these questions.

17. How old are you? *(please circle one number)*

1 17 years or under
2 18 to 24 years
3 25 to 34 years
4 35 to 44 years
5 45 to 54 years
6 55 to 64 years
7 65 years and over

18. Are you male or female? *(please circle one number)*

1 Male
2 Female

19. Do you have children? *(please circle one number)*

1 Yes
2 No

20. What is the highest grade or year of school that you have completed? *(please circle one number)*

1 No school
2 Grade school (1-8 years)
3 Some high school (9-11 years)
4 Completed high school (12 years)
5 Some college but no degree (13-15 years)
6 Associate degree
7 Bachelor's degree
8 Post graduate

21. Regardless of your party identification, how would you rate yourself politically? *(please circle one number)*

1 Very conservative
2 Somewhat conservative
3 Neither conservative nor liberal
4 Somewhat liberal
5 Very liberal

22. Below is a list of household income categories. Which income category best describes the combined year 2000 income of you and all adult family members living with you, before taxes? *(please circle one number)*

1 Less than $10,000
2 $10,000 - $19,999
3 $20,000 - $29,999
4 $30,000 - $39,999
5 $40,000 - $49,999
6 $50,000 - $59,999
7 $60,000 - $69,999
8 $70,000 - $79,999
9 $80,000 - $89,999
10 $90,000 - $99,999
11 $100,000 - $149,999
12 $150,000 or more

Thank you for your cooperation!

Your assistance in answering this survey is very much appreciated.

If we have overlooked something or if you have anything else to tell us,
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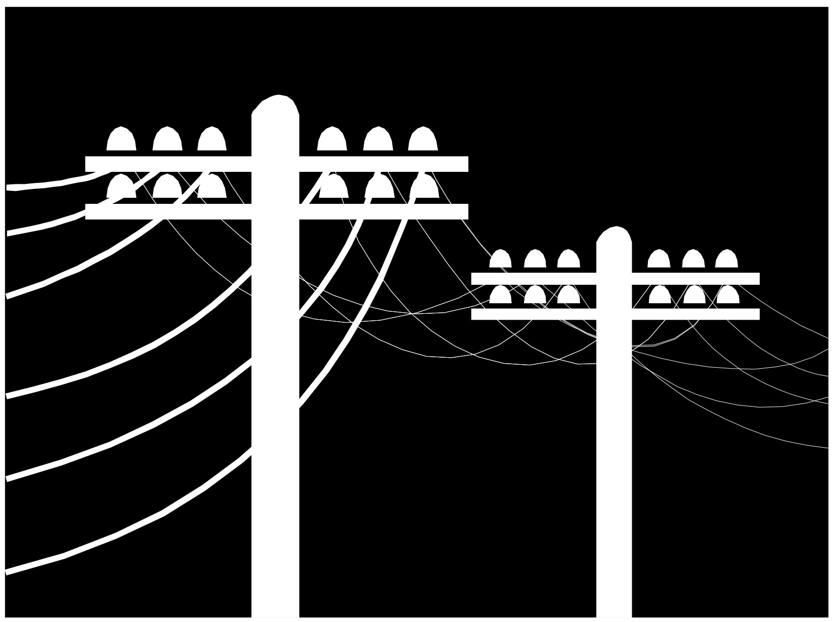
SCENARIO 3: $8/MONTH BID LEVEL

Deciding Our Energy Future:

Choices for Electricity Supply Survey



University of California at Berkeley

Section 1: Energy Issues Facing the United States

To begin, we would like to ask you some questions about yourself and about your feelings on the electricity industry and on renewable energy.

1. **Do you own or rent your residence?** *(please circle one number)*

   1 Own
   2 Rent, lease or other arrangement

2. **Does your household pay its own electricity bill?** *(please circle one number)*

   1 No ☛ Please STOP HERE and return the survey. Thank you for your participation!
   2 Yes ☛ Please GO TO QUESTION 3 and continue with this survey

3. **Households in some states now have the option of choosing which company will provide their electricity (much like choosing a new long-distance telephone provider). Does your household have the option of choosing your electric company?** *(please circle one number)*

   1 No
   2 Yes
   3 Don't know

4. **In meeting the nation's overall electricity needs, please indicate how important each of the following issues is to you.** *(please circle one number for each issue)*

	not at all important				**extremely important**
Ensuring that electricity service is reliable	1	2	3	4	5
Increasing the amount of electricity generated from renewable sources (such as wind and solar)	1	2	3	4	5
Minimizing the cost of electricity to consumers	1	2	3	4	5
Increasing investments in energy efficiency	1	2	3	4	5
Improving the quality of customer service	1	2	3	4	5

5. **Electricity can be generated from many sources. In the United States, about 57% of our electricity comes from coal and oil, 22% from nuclear, 11% from natural gas, 8% from hydropower, and 2% from renewable energy. Even though producing electricity is less damaging to the environment than it used to be, electricity production still contributes significantly to urban smog, acid rain, and global warming. How much do you know about the environmental impacts of electricity production?** *(please circle one number)*

nothing				**a lot**
1	2	3	4	5

6. **There are several ways to reduce the environmental impacts of electricity production. Please indicate how important each of the following three approaches is to you.** *(please circle one number for each approach)*

	not at all important				**extremely important**
Energy Efficiency – reducing electricity use in homes and businesses by installing energy saving appliances and other measures	1	2	3	4	5
Pollution Control – reducing pollution at natural gas and coal plants by installing filters and other pollution control technologies	1	2	3	4	5
Renewable Energy – producing electricity with wind turbines, solar power, geothermal (heat from under the earth), and biomass (using wood and agricultural wastes to produce electricity)	1	2	3	4	5

7. **About 2% of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal, and biomass. Even though renewable energy often costs more than other ways of producing electricity, renewable energy has some benefits. How important to you are each of the possible benefits listed below?** *(please circle one number for each statement)*

How important is it to you that using renewable energy…	**not at all important**				**extremely important**
…may be less threatening to the environment than other ways of producing electricity	1	2	3	4	5
…reduces our dependence on any one type of electricity generation	1	2	3	4	5
…stimulates new technologies	1	2	3	4	5
…preserves the amount of natural gas and coal available for future generations	1	2	3	4	5
…can create new jobs	1	2	3	4	5

8. **There are also some possible drawbacks to using renewable energy. How worried are you about each of the possible drawbacks listed below?** *(please circle one number for each statement)*

How worried are you that renewable energy…	**not at all worried**				**extremely worried**
…could be more costly than other ways of reducing pollution	1	2	3	4	5
…may not be abundant enough for widespread use	1	2	3	4	5
…already receives too many subsidies	1	2	3	4	5
…could have some environmental drawbacks	1	2	3	4	5
…may not be available when we need it because the supply of some types of renewable energy can depend on the weather	1	2	3	4	5

Section 2: Paying for Renewable Energy

The federal government is considering whether and how to support renewable energy in the future. The University of California is conducting this independent survey to help the country make these important choices.

The next questions are intended to find out whether households are willing to pay for renewable energy. Answers to these questions will be used to shape future policy, so we ask you to take some time in your response. There are no right or wrong answers to these questions. We want to know your preferences.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities. Keep in mind that increasing the supply of renewable energy is one of several ways to reduce the environmental impacts of electricity production.

9. The federal government is considering a program where all homes and businesses in the United States would be given the opportunity to voluntarily purchase their electricity from a private company that sells renewable energy. By switching to a private electricity provider and paying an $8 surcharge on their monthly electricity bills for 3 years, homes and businesses will help increase the supply of renewable energy. This surcharge will be collected by the private company and used to build more renewable energy projects. Because switching electricity providers and paying the proposed surcharge is voluntary, many homes and businesses may decide not to switch providers and not to pay.

Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $8/month for 3 years will provide the same environmental benefits as not driving a car a total of 192,000 miles. If every home and business were to pay this surcharge, renewable energy production in the United States would increase from 2% to 18%.

Remembering that all homes and businesses in the United States will be able to individually decide whether to contribute and that many homes and businesses may decide not to pay, would your household volunteer to switch to a private electricity provider and pay this proposed monthly surcharge of $8 for 3 years (equal to $96 per year and $288 over the life of the program)? *(please circle one number)*

1. No ☚ GO TO QUESTION 10
2. Yes ☚ GO TO QUESTION 11

10. **(If no) There are many reasons why households may not be willing to volunteer to switch to a private electricity provider and pay this surcharge. Of the possible reasons listed below, please circle <u>all that apply</u> to you and your household.** *(please circle ALL that apply)*

1 My household can't afford to pay this much for renewable energy
2 The benefits of renewable energy aren't great enough to warrant the surcharge
3 Renewable energy should be supported, but I think all households should be required to pay and that it shouldn't be voluntary
4 Renewable energy should be supported, but I wouldn't trust the private company to effectively spend the funds collected by the surcharge
5 I am opposed to all new government programs
6 I wouldn't want to switch electricity providers for other reasons
7 I object to these types of questions
8 I would need more information before making a decision
9 Other *(Please Specify)*____

☛ GO TO QUESTION 12

11. **(If yes) We know that some people are more certain than others about their answers. On a scale of 1 to 5, where 1 means "very uncertain" and 5 means "very certain," how certain are you that your household would volunteer to switch to a private electricity provider and pay this $8 monthly surcharge?** *(please circle one number)*

very uncertain				**very certain**
1	2	3	4	5

12. **Remembering that all homes and businesses in the United States would be able to individually decide whether to contribute, what percent of <u>all U.S. residents</u> do you believe would voluntarily switch to a private electricity provider and pay this $8 monthly surcharge?** *(please circle one number)*

1 less than 10% of residents
2 10% to 19% of residents
3 20% to 29% of residents
4 30% to 39% of residents
5 40% to 49% of residents
6 50% to 59% of residents
7 60% to 69% of residents
8 70% to 79% of residents
9 80% to 89% of residents
10 90% to 100% of residents

Section 3: Your Attitudes about Environmental Issues

13. Please indicate how strongly you disagree or agree with each of the following statements. *(please circle one number for each statement)*

	strongly disagree	somewhat disagree	neutral	somewhat agree	strongly agree
I am often one of the first people I know to try new products	1	2	3	4	5
There is not much that any one individual can do about the environment	1	2	3	4	5
I am more likely to buy environmentally friendly products if I know that other people are doing the same	1	2	3	4	5
I don’t trust the environmental claims of companies offering environmentally friendly products	1	2	3	4	5
I don’t trust other people to make personal sacrifices to protect the environment	1	2	3	4	5
Now that companies are offering environmentally friendly products, we don’t need as many environmental regulations	1	2	3	4	5
The government can’t be trusted to collect funds and spend them on worthwhile causes	1	2	3	4	5
The government should require everyone to help pay for environmental improvements	1	2	3	4	5
I will only pay more for environmentally friendly products if I receive a direct benefit from doing so	1	2	3	4	5
I think my family and friends would support renewable energy if they had the option	1	2	3	4	5

14. Which of the following actions do you and your household do on a <u>regular</u> basis? *(please circle ALL that apply)*

1 Try to buy products that are environmentally friendly
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4 Purchase organic foods
5 Reduce energy use in the home
6 Walk, ride a bike, carpool, or take mass transit to help the environment
7 Donate money to environmental causes
8 Volunteer time to environmental causes
9 Invest money in companies that are socially responsible
10 Write letters to politicians about environmental issues
11 Weigh candidates' environmental records when deciding who to vote for

15. How much do you think <u>individuals like yourself</u> can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

16. How much do you think government programs and regulations can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
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decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

Section 4: About You

These last few questions will help us understand how well you and other respondents to the survey represent all U.S. residents. All the information in this section (and the entire survey booklet) is confidential. Your name will never be associated with your answers to these questions.

17. How old are you? *(please circle one number)*

1 17 years or under
2 18 to 24 years
3 25 to 34 years
4 35 to 44 years
5 45 to 54 years
6 55 to 64 years
7 65 years and over

18. Are you male or female? *(please circle one number)*

1 Male
2 Female

19. Do you have children? *(please circle one number)*

1 Yes
2 No

20. What is the highest grade or year of school that you have completed? *(please circle one number)*

1 No school
2 Grade school (1-8 years)
3 Some high school (9-11 years)
4 Completed high school (12 years)
5 Some college but no degree (13-15 years)
6 Associate degree
7 Bachelor's degree
8 Post graduate

21. Regardless of your party identification, how would you rate yourself politically? *(please circle one number)*

1 Very conservative
2 Somewhat conservative
3 Neither conservative nor liberal
4 Somewhat liberal
5 Very liberal

22. Below is a list of household income categories. Which income category best describes the combined year 2000 income of you and all adult family members living with you, before taxes? *(please circle one number)*

1 Less than $10,000
2 $10,000 - $19,999
3 $20,000 - $29,999
4 $30,000 - $39,999
5 $40,000 - $49,999
6 $50,000 - $59,999
7 $60,000 - $69,999
8 $70,000 - $79,999
9 $80,000 - $89,999
10 $90,000 - $99,999
11 $100,000 - $149,999
12 $150,000 or more

Thank you for your cooperation!

Your assistance in answering this survey is very much appreciated.

If we have overlooked something or if you have anything else to tell us,
please feel free to do so in the space below.

Please return your completed survey in the postage-paid envelope provided to:

Choices for Electricity Supply Survey
University of California at Berkeley
c/o PA Consulting Group
2711 Allen Boulevard, Suite 200
Middleton, WI 53562

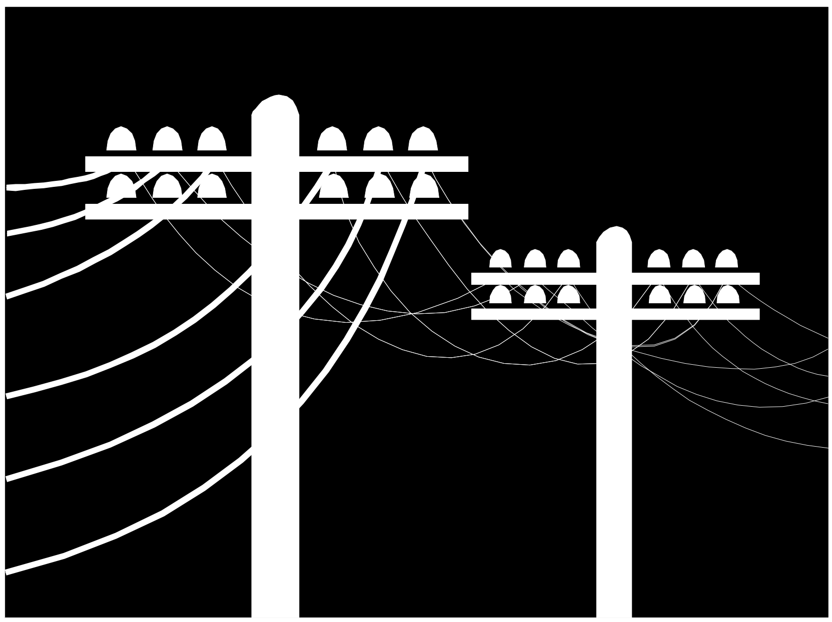
If you have any questions about the survey, please contact: Kim Bakalars 1-800-935-4277

The results of this study will be available on the Internet by December 2001 at:
www.are.berkeley.edu/CESS

SCENARIO 4: 50 CENTS/MONTH BID LEVEL

Deciding Our Energy Future:

Choices for Electricity Supply Survey



University of California at Berkeley

Section 1: Energy Issues Facing the United States

To begin, we would like to ask you some questions about yourself and about your feelings on the electricity industry and on renewable energy.

1. **Do you own or rent your residence?** *(please circle one number)*

   1 Own
   2 Rent, lease or other arrangement

2. **Does your household pay its own electricity bill?** *(please circle one number)*

   1 No ☞ Please STOP HERE and return the survey. Thank you for your participation!
   2 Yes ☞ Please GO TO QUESTION 3 and continue with this survey

3. **Households in some states now have the option of choosing which company will provide their electricity (much like choosing a new long-distance telephone provider). Does your household have the option of choosing your electric company?** *(please circle one number)*

   1 No
   2 Yes
   3 Don't know

4. **In meeting the nation's overall electricity needs, please indicate how important each of the following issues is to you.** *(please circle one number for each issue)*

	not at all important				**extremely important**
Ensuring that electricity service is reliable	1	2	3	4	5
Increasing the amount of electricity generated from renewable sources (such as wind and solar)	1	2	3	4	5
Minimizing the cost of electricity to consumers	1	2	3	4	5
Increasing investments in energy efficiency	1	2	3	4	5
Improving the quality of customer service	1	2	3	4	5

5. **Electricity can be generated from many sources. In the United States, about 57% of our electricity comes from coal and oil, 22% from nuclear, 11% from natural gas, 8% from hydropower, and 2% from renewable energy. Even though producing electricity is less damaging to the environment than it used to be, electricity production still contributes significantly to urban smog, acid rain, and global warming. How much do you know about the environmental impacts of electricity production?** *(please circle one number)*

nothing				**a lot**
1	2	3	4	5

6. **There are several ways to reduce the environmental impacts of electricity production. Please indicate how important each of the following three approaches is to you.** *(please circle one number for each approach)*

	not at all important				**extremely important**
Energy Efficiency – reducing electricity use in homes and businesses by installing energy saving appliances and other measures	1	2	3	4	5
Pollution Control – reducing pollution at natural gas and coal plants by installing filters and other pollution control technologies	1	2	3	4	5
Renewable Energy – producing electricity with wind turbines, solar power, geothermal (heat from under the earth), and biomass (using wood and agricultural wastes to produce electricity)	1	2	3	4	5

7. **About 2% of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal, and biomass. Even though renewable energy often costs more than other ways of producing electricity, renewable energy has some benefits. How important to you are each of the possible benefits listed below?** *(please circle one number for each statement)*

How important is it to you that using renewable energy…	**not at all important**				**extremely important**
…may be less threatening to the environment than other ways of producing electricity	1	2	3	4	5
…reduces our dependence on any one type of electricity generation	1	2	3	4	5
…stimulates new technologies	1	2	3	4	5
…preserves the amount of natural gas and coal available for future generations	1	2	3	4	5
…can create new jobs	1	2	3	4	5

8. **There are also some possible drawbacks to using renewable energy. How worried are you about each of the possible drawbacks listed below?** *(please circle one number for each statement)*

How worried are you that renewable energy…	**not at all worried**				**extremely worried**
…could be more costly than other ways of reducing pollution	1	2	3	4	5
…may not be abundant enough for widespread use	1	2	3	4	5
…already receives too many subsidies	1	2	3	4	5
…could have some environmental drawbacks	1	2	3	4	5
…may not be available when we need it because the supply of some types of renewable energy can depend on the weather	1	2	3	4	5

Section 2: Paying for Renewable Energy

The federal government is considering whether and how to support renewable energy in the future. The University of California is conducting this independent survey to help the country make these important choices.

The next questions are intended to find out whether households are willing to pay for renewable energy. Answers to these questions will be used to shape future policy, so we ask you to take some time in your response. <u>There are no right or wrong answers to these questions.</u> We want to know <u>your</u> preferences.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities. Keep in mind that increasing the supply of renewable energy is one of several ways to reduce the environmental impacts of electricity production.

9. **The federal government is considering a program where all electricity suppliers (e.g., utilities) in the United States would be required to purchase some of their electricity from private companies that sell renewable energy. To meet this requirement, and to increase the supply of renewable energy, all homes and businesses in the United States would be <u>required to pay a $0.50 surcharge</u> on their monthly electricity bills for 3 years. This surcharge will be collected by each customers' <u>electricity supplier</u> and used by <u>private companies</u> that sell renewable energy to build more renewable energy projects. Because the proposed surcharge is mandatory, all homes and businesses will be required to pay.**

   Data from the U.S. Environmental Protection Agency shows that for each household a surcharge of $0.50/month for 3 years will provide the same environmental benefits as not driving a car a total of 12,000 miles. Because every home and business would be required to pay this surcharge, renewable energy production in the United States would increase from 2% to 3%.

   Remembering that all homes and businesses in the United States will have to pay the same amount if this policy is adopted, would your household support the adoption of this proposed monthly surcharge of $0.50 for 3 years (equal to $6 per year and $18 over the life of the program)? *(please circle one number)*

   1 No ☛ GO TO QUESTION 10
   2 Yes ☛ GO TO QUESTION 11

10. If no) There are many reasons why households may not be willing to support the adoption of this required surcharge. Of the possible reasons listed below, please circle <u>all that apply</u> to you and your household. *(please circle ALL that apply)*

1 My household can't afford to pay this much for renewable energy
2 The benefits of renewable energy aren't great enough to warrant the surcharge
3 Renewable energy should be supported, but I think households should be able to voluntarily pay for renewable energy and that it shouldn't be required
4 Renewable energy should be supported, but I wouldn't trust electricity suppliers and/or private companies to effectively spend the funds collected by the surcharge
5 I am opposed to all new government programs
6 I object to these types of questions
7 I would need more information before making a decision
8 Other *(Please Specify)*________________________________

✒ GO TO QUESTION 12

11. (If yes) We know that some people are more certain than others about their answers. On a scale of 1 to 5, where 1 means "very uncertain" and 5 means "very certain," how certain are you that your household would support the adoption of this required $0.50 monthly surcharge? *(please circle one number)*

very uncertain				**very certain**
1	2	3	4	5

12. Remembering that all homes and businesses in the United States would have to pay the same amount if this policy was adopted, what percent of <u>all U.S. residents</u> do you believe would support the adoption of this required $0.50 monthly surcharge? *(please circle one number)*

1 less than 10% of residents
2 10% to 19% of residents
3 20% to 29% of residents
4 30% to 39% of residents
5 40% to 49% of residents
6 50% to 59% of residents
7 60% to 69% of residents
8 70% to 79% of residents
9 80% to 89% of residents
10 90% to 100% of residents

Section 3: Your Attitudes about Environmental Issues

13. Please indicate how strongly you disagree or agree with each of the following statements. *(please circle one number for each statement)*

	strongly disagree	somewhat disagree	neutral	somewhat agree	strongly agree
I am often one of the first people I know to try new products	1	2	3	4	5
There is not much that any one individual can do about the environment	1	2	3	4	5
I am more likely to buy environmentally friendly products if I know that other people are doing the same	1	2	3	4	5
I don’t trust the environmental claims of companies offering environmentally friendly products	1	2	3	4	5
I don’t trust other people to make personal sacrifices to protect the environment	1	2	3	4	5
Now that companies are offering environmentally friendly products, we don’t need as many environmental regulations	1	2	3	4	5
The government can’t be trusted to collect funds and spend them on worthwhile causes	1	2	3	4	5
The government should require everyone to help pay for environmental improvements	1	2	3	4	5
I will only pay more for environmentally friendly products if I receive a direct benefit from doing so	1	2	3	4	5
I think my family and friends would support renewable energy if they had the option	1	2	3	4	5

14. Which of the following actions do you and your household do on a regular basis? *(please circle ALL that apply)*

1 Try to buy products that are environmentally friendly
2 Pay more for products that are environmentally friendly
3 Recycle newspaper, metals, plastics, or glass
4 Purchase organic foods
5 Reduce energy use in the home
6 Walk, ride a bike, carpool, or take mass transit to help the environment
7 Donate money to environmental causes
8 Volunteer time to environmental causes
9 Invest money in companies that are socially responsible
10 Write letters to politicians about environmental issues
11 Weigh candidates' environmental records when deciding who to vote for

15. How much do you think individuals like yourself can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

16. How much do you think government programs and regulations can do about the following? *(please circle one number for each problem)*

	nothing	not much	some-thing	a lot
reducing litter in public places	1	2	3	4
decreasing the amount of solid waste in landfills	1	2	3	4
decreasing air pollution that produces smog	1	2	3	4
lessening the destruction of the ozone layer	1	2	3	4
increasing the amount of renewable energy used	1	2	3	4
reducing the threat of global warming	1	2	3	4
reducing the loss of wilderness areas	1	2	3	4

Section 4: About You

These last few questions will help us understand how well you and other respondents to the survey represent all U.S. residents. All the information in this section (and the entire survey booklet) is confidential. Your name will never be associated with your answers to these questions.

17. How old are you? *(please circle one number)*

1 17 years or under
2 18 to 24 years
3 25 to 34 years
4 35 to 44 years
5 45 to 54 years
6 55 to 64 years
7 65 years and over

18. Are you male or female? *(please circle one number)*

1 Male
2 Female

19. Do you have children? *(please circle one number)*

1 Yes
2 No

20. What is the highest grade or year of school that you have completed? *(please circle one number)*

1 No school
2 Grade school (1-8 years)
3 Some high school (9-11 years)
4 Completed high school (12 years)
5 Some college but no degree (13-15 years)
6 Associate degree
7 Bachelor's degree
8 Post graduate

21. Regardless of your party identification, how would you rate yourself politically? *(please circle one number)*

1 Very conservative
2 Somewhat conservative
3 Neither conservative nor liberal
4 Somewhat liberal
5 Very liberal

22. Below is a list of household income categories. Which income category best describes the combined year 2000 income of you and all adult family members living with you, before taxes? *(please circle one number)*

1 Less than $10,000
2 $10,000 - $19,999
3 $20,000 - $29,999
4 $30,000 - $39,999
5 $40,000 - $49,999
6 $50,000 - $59,999
7 $60,000 - $69,999
8 $70,000 - $79,999
9 $80,000 - $89,999
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12 $150,000 or more

Thank you for your cooperation!

Your assistance in answering this survey is very much appreciated.

If we have overlooked something or if you have anything else to tell us,
please feel free to do so in the space below.

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If you have any questions about the survey, please contact: Kim Bakalars 1-800-935-4277

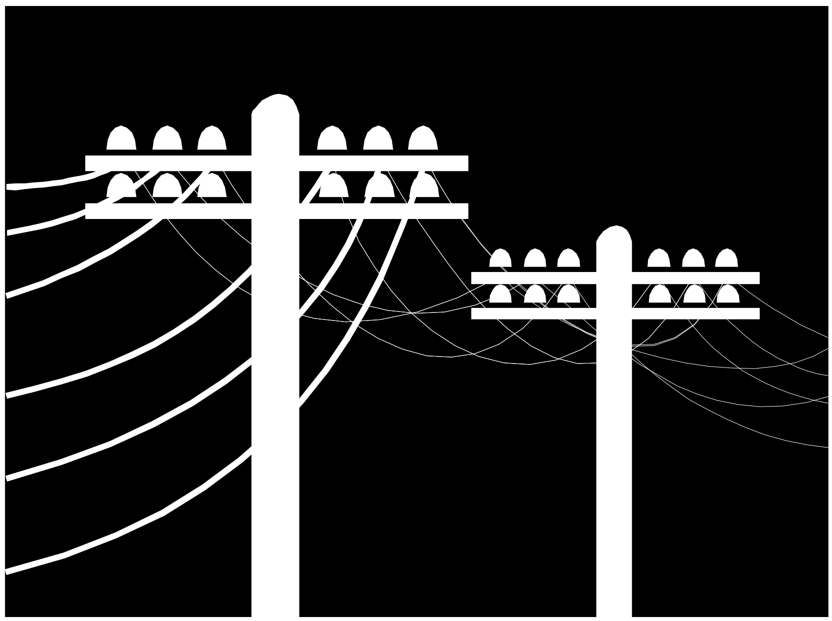
The results of this study will be available on the Internet by December 2001 at:
www.are.berkeley.edu/CESS

Appendix E

Opinion Survey

Deciding Our Energy Future:

Choices for Electricity Supply Survey



University of California at Berkeley

Section 1: Energy Issues Facing the United States

To begin, we would like to ask you some questions about yourself and about your feelings on the electricity industry and on renewable energy.

1. Do you own or rent your residence? *(please circle one number)*

1 Own
2 Rent, lease or other arrangement

2. Does your household pay its own electricity bill? *(please circle one number)*

1 No ☛ Please STOP HERE and return the survey. Thank you for your participation!
2 Yes ☛ Please GO TO QUESTION 3 and continue with this survey

3. Households in some states now have the option of choosing which company will provide their electricity (much like choosing a new long-distance telephone provider). Does your household have the option of choosing your electric company? *(please circle one number)*

1 No
2 Yes
3 Don't know

4. In meeting the nation's overall electricity needs, please indicate how important each of the following issues is to you. *(please circle one number for each issue)*

	not at all important				**extremely important**
Ensuring that electricity service is reliable	1	2	3	4	5
Increasing the amount of electricity generated from renewable sources (such as wind and solar)	1	2	3	4	5
Minimizing the cost of electricity to consumers	1	2	3	4	5
Increasing investments in energy efficiency	1	2	3	4	5
Improving the quality of customer service	1	2	3	4	5

5. **Electricity can be generated from many sources. In the United States, about 57% of our electricity comes from coal and oil, 22% from nuclear, 11% from natural gas, 8% from hydropower, and 2% from renewable energy. Even though producing electricity is less damaging to the environment than it used to be, electricity production still contributes significantly to urban smog, acid rain, and global warming. How much do you know about the environmental impacts of electricity production?** *(please circle one number)*

nothing				**a lot**
1	2	3	4	5

6. **There are several ways to reduce the environmental impacts of electricity production. Please indicate how important each of the following three approaches is to you.** *(please circle one number for each approach)*

	not at all important				**extremely important**
Energy Efficiency – reducing electricity use in homes and businesses by installing energy saving appliances and other measures	1	2	3	4	5
Pollution Control – reducing pollution at natural gas and coal plants by installing filters and other pollution control technologies	1	2	3	4	5
Renewable Energy – producing electricity with wind turbines, solar power, geothermal (heat from under the earth), and biomass (using wood and agricultural wastes to produce electricity)	1	2	3	4	5

7. **About 2% of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal, and biomass. Even though renewable energy often costs more than other ways of producing electricity, renewable energy has some benefits. How important to you are each of the possible benefits listed below?** *(please circle one number for each statement)*

How important is it to you that using renewable energy…	**not at all important**				**extremely important**
…may be less threatening to the environment than other ways of producing electricity	1	2	3	4	5
…reduces our dependence on any one type of electricity generation	1	2	3	4	5
…stimulates new technologies	1	2	3	4	5
…preserves the amount of natural gas and coal available for future generations	1	2	3	4	5
…can create new jobs	1	2	3	4	5

8. **There are also some possible drawbacks to using renewable energy. How worried are you about each of the possible drawbacks listed below?** *(please circle one number for each statement)*

How worried are you that renewable energy…	**not at all worried**				**extremely worried**
…could be more costly than other ways of reducing pollution	1	2	3	4	5
…may not be abundant enough for widespread use	1	2	3	4	5
…already receives too many subsidies	1	2	3	4	5
…could have some environmental drawbacks	1	2	3	4	5
…may not be available when we need it because the supply of some types of renewable energy can depend on the weather	1	2	3	4	5

Section 2: Paying for Renewable Energy

The federal government is considering whether and how to support renewable energy in the future. The University of California is conducting this independent survey to help the country make these important choices.

The next questions are intended to find out the preferences of U.S. residents about whether and how to pay for renewable energy. Answers to these questions will be used to shape future policy, so we ask you to take some time in your response. There are no right or wrong answers to these questions. We want to know your preferences.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities. Keep in mind that increasing the supply of renewable energy is one of several ways to reduce the environmental impacts of electricity production.

9. **Do you believe that renewable energy production should be increased, even if it costs more than other electricity production options?** *(please circle one number)*

   1 Yes
   2 No

10. **If renewable energy is to be supported, the extra money needed to increase the supply of renewable energy could be collected in a number of ways. Of the two possible approaches listed below, which one would you most prefer?** *(please circle one number)*

   1 **Option 1:** The extra money could be raised through a required surcharge on the electricity bills of all homes and businesses in the United States
   ☛ GO TO QUESTION 11

   2 **Option 2:** The extra money could be raised through a voluntarily surcharge on the electricity bills of only those homes and businesses in the United States that volunteer to support renewable energy
   ☛ GO TO QUESTION 12

11. **(If Option 1) There are many possible reasons why individuals might prefer that all households and businesses be required to pay for renewable energy. Of the possible reasons listed below, please circle all that apply to you.** *(please circle ALL that apply)*

    1 I don't trust other people to voluntarily pay more for renewable energy
    2 Renewable energy benefits everyone so everyone should be required to pay (i.e., it shouldn't be voluntary)
    3 If everyone pays, the actual yearly cost of renewable energy could be lower
    4 Other (please describe)____

    ☛ GO TO QUESTION 13

12. **(If Option 2) There are many possible reasons why individuals might prefer that payments for renewable energy by households and businesses be voluntary. Of the possible reasons listed below, please circle all that apply to you.** *(please circle ALL that apply)*

    1. Renewable energy just isn't that important to me
    2. I couldn't afford to pay more for renewable energy
    3. Voluntary action by individuals can go a long way towards improving the environment
    4. People shouldn't be required to pay for something they don't want
    5. Other (please describe) ____

13. **Funds used to support renewable energy could also be managed in many ways. Of the two possible approaches listed below, which one would you most prefer?** *(please circle one number)*

    1 **Option 1:** Funds from an electricity bill surcharge could be collected by the government and used to help fund the construction of more renewable energy projects

    2 **Option 2:** Funds from an electricity bill surcharge could be collected by each customers' electricity supplier and used by private companies that sell renewable energy to build more renewable energy projects

Section 3: Voluntarily Purchasing Renewable Energy

In this section, we would like to learn a bit more about your interest in voluntarily purchasing renewable energy from your electric utility or from a new electricity supplier.

14. Some households in the United States now have the option to voluntarily purchase renewable energy from their existing electric utility or from a new electricity supplier. With utility deregulation, new electricity suppliers in some states are marketing renewable energy. In states that have not deregulated their electricity industry, some electric utilities offer their customers the ability to pay a premium for renewable energy. Does your household have the option to voluntarily purchase renewable energy through one of these programs? *(please circle one number)*

1. Yes
2. No
3. Don't know

15. Would your household be willing to voluntarily purchase renewable energy from one of these types of programs if it cost an extra $3 on your monthly electricity bills? *(please circle one number)*

1 Yes ☛ **GO TO QUESTION 16**
2 No ☛ **GO TO QUESTION 18**

16. (If "Yes" to Question 15) Now assume that the government placed a <u>required</u> $2 surcharge on the monthly electricity bills of all homes and businesses in the United States, including yours, to raise funds for renewable energy. In this case, would your household still be willing to <u>voluntarily</u> purchase renewable energy for an extra $3 per month in addition to the required $2 charge? *(please circle one number)*

1 Yes
2 No

17. (If "Yes" to Question 15) These voluntary renewable energy programs can be designed in many ways. As noted earlier, in some states households have the option of choosing which company will provide their electricity and can choose a new electricity supplier that sells renewable energy. In other states, households can only purchase renewable energy from their existing electric utility. If you could choose, which of these two options would be more appealing to you? *(please circle one number)*

1. a program offered by a new electricity supplier
2. a program offered by my existing electric utility

18. There are many possible concerns that people might have about voluntarily purchasing renewable energy from one of these programs. Of the possible concerns listed below, please circle <u>all that apply</u> to you and your household. *(please circle ALL that apply)*

1 I'm not sure my household could afford the extra cost of renewable energy
2 Renewable energy just isn't that important to my household
3 Renewable energy benefits everyone so everyone should be required to pay (i.e., it shouldn't be voluntary)
4 I am not sure I would trust my electric utility or these new companies to effectively provide renewable energy
5 I wouldn't trust the new companies to provide high-quality service
6 Other (please describe)____

19. Which <u>one</u> of the following statements do you <u>most</u> agree with? *(please circle ONLY one number)*

1 My household would be <u>more</u> interested in purchasing renewable energy if we knew that lots of other households were also purchasing renewable energy

2 My household would <u>not be affected</u> by the behavior of other households when deciding whether to purchase renewable energy

3 My household would be <u>less</u> interested in purchasing renewable energy if we knew that lots of other households were also purchasing renewable energy

20. If every household and business in the United States had the chance to voluntarily purchase renewable energy through one of these programs, how do you think that would affect the need for the government to continue its support of renewable energy? *(please circle one number)*

1. Government support would no longer be necessary
2. The need for government support would decrease somewhat
3. It would have no effect on the need for government support
4. The need for government support would increase somewhat

Section 4: Your Attitudes about Environmental Issues

21. Please indicate how strongly you disagree or agree with each of the following statements. *(please circle one number for each statement)*

	strongly disagree	somewhat disagree	neutral	somewhat agree	strongly agree
I am often one of the first people I know to try new products	1	2	3	4	5
There is not much that any one individual can do about the environment	1	2	3	4	5
I am more likely to buy environmentally friendly products if I know that other people are doing the same	1	2	3	4	5
I don’t trust the environmental claims of companies offering environmentally friendly products	1	2	3	4	5
I don’t trust other people to make personal sacrifices to protect the environment	1	2	3	4	5
Now that companies are offering environmentally friendly products, we don’t need as many environmental regulations	1	2	3	4	5
The government can’t be trusted to collect funds and spend them on worthwhile causes	1	2	3	4	5
The government should require everyone to help pay for environmental improvements	1	2	3	4	5
I will only pay more for environmentally friendly products if I receive a direct benefit from doing so	1	2	3	4	5
I think my family and friends would support renewable energy if they had the option	1	2	3	4	5

22. Which of the following actions do you and your household do on a <u>regular</u> basis? *(please circle ALL that apply)*

1 Try to buy products that are environmentally friendly
2 Pay more for products that are environmentally friendly
3 Recycle newspaper, metals, plastics, or glass
4 Purchase organic foods
5 Reduce energy use in the home
6 Walk, ride a bike, carpool, or take mass transit to help the environment
7 Donate money to environmental causes
8 Volunteer time to environmental causes
9 Invest money in companies that are socially responsible
10 Write letters to politicians about environmental issues
11 Weigh candidates' environmental records when deciding who to vote for

23. Please indicate how strongly you disagree or agree with the following statement: "People generally act in their own self-interest when they <u>purchase consumer products and services."</u> *(please circle one number)*

1 strongly disagree
2 somewhat disagree
3 neutral
4 somewhat agree
5 strongly agree

24. Please indicate how strongly you disagree or agree with the following statement: "People generally act in their own self-interest when they <u>vote for political candidates and initiatives."</u> *(please circle one number)*

1 strongly disagree
2 somewhat disagree
3 neutral
4 somewhat agree
5 strongly agree

Section 5: About You

These last few questions will help us understand how well you and other respondents to the survey represent all U.S. residents. All the information in this section (and the entire survey booklet) is confidential. Your name will never be associated with your answers to these questions.

25. How old are you? *(please circle one number)*

1 17 years or under
2 18 to 24 years
3 25 to 34 years
4 35 to 44 years
5 45 to 54 years
6 55 to 64 years
7 65 years and over

26. Are you male or female? *(please circle one number)*

1 Male
2 Female

27. Do you have children? *(please circle one number)*

1 Yes
2 No

28. What is the highest grade or year of school that you have completed? *(please circle one number)*

1 No school
2 Grade school (1-8 years)
3 Some high school (9-11 years)
4 Completed high school (12 years)
5 Some college but no degree (13-15 years)
6 Associate degree
7 Bachelor’s degree
8 Post graduate

29. Regardless of your party identification, how would you rate yourself politically? *(please circle one number)*

1 Very conservative
2 Somewhat conservative
3 Neither conservative nor liberal
4 Somewhat liberal
5 Very liberal

30. Below is a list of household income categories. Which income category best describes the combined year 2000 income of you and all adult family members living with you, before taxes? *(please circle one number)*

1 Less than $10,000
2 $10,000 - $19,999
3 $20,000 - $29,999
4 $30,000 - $39,999
5 $40,000 - $49,999
6 $50,000 - $59,999
7 $60,000 - $69,999
8 $70,000 - $79,999
9 $80,000 - $89,999
10 $90,000 - $99,999
11 $100,000 - $149,999
12 $150,000 or more

Thank you for your cooperation!

Your assistance in answering this survey is very much appreciated.

If we have overlooked something or if you have anything else to tell us,
please feel free to do so in the space below.

Please return your completed survey in the postage-paid envelope provided to:

Choices for Electricity Supply Survey
University of California at Berkeley
c/o PA Consulting Group
2711 Allen Boulevard, Suite 200
Middleton, WI 53562

If you have any questions about the survey, please contact: Kim Bakalars 1-800-935-4277

The results of this study will be available on the Internet by December 2001 at:
www.are.berkeley.edu/CESS

Appendix F

Telephone Script for Contingent Valuation and Opinion Surveys

INDICATE QUESTIONNAIRE VERSION: ____
INDICATE BID LEVEL (if CV): ___

This is ____________ calling on behalf of the University of California at Berkeley. May I please speak to _________? (Please speak with any adult decision-maker in the household).

Q1 Around DATE HERE, we mailed you a second copy of a questionnaire asking your opinions about the energy and environmental choices facing the United States. The survey had a picture of power lines on the cover. Do you remember receiving the survey?

[Interviewer: PROVIDE SOME BACKGROUND DETAILS ON SURVEY AND IMPLEMENTATION IF NECESSARY?]

1	yes	**GO TO Q2**
2	no	**SKIP TO Q4**

Q2 As of today, we haven't received your completed survey. You are part of a small group of individuals the University has contacted about the energy choices facing the nation, so your opinions are very important. The University of California is conducting this research to help the country make important decisions about electricity generation. Could you find the time in the next couple of days to complete the survey and return it to us?

(PROBE: Do you still have a copy of the survey?)

1	Will return, has survey	**SKIP TO Q7**
2	Will return, needs another survey	**SKIP TO Q5**
3	Won't return survey	**SKIP TO Q6**
4	Survey has already been returned	**SKIP TO Q7**

Q3 Would you like us to send you an additional copy of the survey?

1	yes	**SKIP TO Q5**
2	no	**SKIP TO Q6**

Q4 You are part of a small group of individuals the University is contacting about the energy choices facing the nation, so your opinions are very important. The University of California is conducting this research to help the country make important decisions about electricity generation. Could we mail you another copy of the survey for you to fill out?

1 yes **GO TO Q5**
2 no **SKIP TO Q6**

Q5 **Verify** (if new survey needs to be send) I would like to verify mailing information that I have. I have your name as….

Name ____
Street Address ______________________________________
City __________________________ State _____ Zip __________

SKIP TO Q7

Q6 It is very important for our preliminary analysis that we understand how those who haven't returned the survey compare to those who did. We would like to ask you just a few questions on the phone so that we do not misinterpret our survey results. I'd like to remind you that all of your answers will be kept confidential by the University of California.

1 continue **skip to Q8**
2 no **ask for more convenient time, or thank and terminate**

Q7 We need to start our analysis very soon, so we would like to ask you just a few questions on the phone. I'd like to remind you that all of your answers will be kept confidential by the University of California.

1 continue **skip to Q8**
2 no **ask for more convenient time, or thank and terminate**

<u>CV SURVEY VERSIONS</u>

Q8 Do you own or rent your residence?

1 own
2 rent, lease or other arrangement

Q9 Does your household pay its own electricity bill?
1 No **thank and terminate**
2 Yes

Q10 Some people say producing electricity is harmful to the environment. There are several ways to reduce these impacts, including (1) using electricity more efficiently in homes and businesses, (2) reducing pollution at natural gas and coal plants, and (3) producing electricity with renewable energy, which includes wind turbines, solar power, geothermal power, and biomass power. Which of these options do you think is most important?

[INTERVIEWER: IF ASKED, GEOTHERMAL POWER IS HEAT FROM UNDER THE EARTH AND BIOMASS IS USING WOOD AND AGRICULTURAL WASTES TO PRODUCE ELECTRICITY]

1 energy efficiency
2 reducing pollution directly
3 renewable energy

Q11 About two percent of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal power, and biomass power. The federal government is considering whether and how to support renewable energy in the future. The next question is intended to find out whether households are willing to pay for renewable energy. There are no right or wrong answers to this question.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities.

INSERT APPROPRIATE CV QUESTION [QUESTION 9]. SPECIFIC BID LEVEL AND PAYMENT METHOD WILL DEPEND ON RESPONDENT-SURVEY ID NUMBER.

IF YES, GO TO Q12. IF NO, GO DIRECTLY TO Q13.

Q12 (If Yes to Q11) **INSERT APPROPRIATE Q11 FROM CV SURVEYS HERE. SPECIFIC BID LEVEL AND QUESTION WORDING WILL DEPEND ON RESPONDENT-SURVEY ID NUMBER.**

Q13 How old are you?

1 17 or under
2 18 to 24
3 25 to 34
4 35 to 44
5 45 to 54
6 55 to 64
7 65 and over

Q14 What is the highest grade or year of school that you have completed?

1 no school
2 grade school (1-8 years)
3 some high school (9-11 years)
4 completed high school (12 years)
5 some college but no degree (13-15 years)
6 associate degree
7 bachelor's degree
8 post graduate

Q15 And finally, regardless of your party identification, how would your rate yourself politically. Very conservative, somewhat conservative, neither conservative nor liberal, somewhat liberal, or very liberal.

1 very conservative
2 somewhat conservative
3 neither conservative nor liberal
4 somewhat liberal
5 very liberal

Thank you very much for answering these few questions.

[FOR THOSE WHO INDICATED THEY WOULD LIKE A NEW SURVEY OR WOULD SEND IN A SURVEY THEY ALREADY HAVE]… We look forward to receiving all of your opinions in your completed mail survey. We really appreciate your participation in this brief survey.

Gender

Respondent gender:

1 male
2 female

NON CV SURVEY VERSIONS

Q8 Do you own or rent your residence?

1 own
2 rent, lease or other arrangement

Q9 Does your household pay its own electricity bill?
1 No **thank and terminate**
2 Yes

Q10 Some people say producing electricity is harmful to the environment. There are several ways to reduce these impacts, including (1) using electricity more efficiently in homes and businesses, (2) reducing pollution at natural gas and coal plants, and (3) producing electricity with renewable energy, which includes wind turbines, solar power, geothermal power, and biomass power. Which of these options do you think is most important?

[INTERVIEWER: IF ASKED, GEOTHERMAL POWER IS HEAT FROM UNDER THE EARTH AND BIOMASS IS USING WOOD AND AGRICULTURAL WASTES TO PRODUCE ELECTRICITY]

1 energy efficiency
2 reducing pollution directly
3 renewable energy

Q11 About two percent of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal power, and biomass power. The federal government is considering whether and how to support renewable energy in the future. The next questions are intended to find out your preferences about whether and how to pay for renewable energy. There are no right or wrong answers to these questions.

When answering, please consider your household income and other household expenses. Money you spend on renewable energy will decrease the amount of money your household has available for other household items and charities.

Do you believe that renewable energy production should be increased, even if it costs more than other electricity production options?

1. Yes
2. No

Q12 If renewable energy is to be supported, the extra money needed to increase the supply of renewable energy could be collected in a number of ways. One option is that the extra money could be raised through a required surcharge on the electricity bills of all homes and businesses in the United States. Another option is that the extra money could be raised through a voluntarily surcharge on the electricity bills of only those homes and businesses in the United States that volunteer to support renewable energy. Of these two possible approaches, which one would you most prefer?

1. a required surcharge
2. a voluntary surcharge

Q13 The funds used to support renewable energy could also be managed in many ways. One option is that funds from an electricity bill surcharge could be collected by the government and used to help fund the construction of more renewable energy projects. Another option is that funds from an electricity bill surcharge could be collected by each customers' electricity supplier and used by private companies that sell renewable energy to build more renewable energy projects. Of these two possible approaches, which one would you most prefer?

1. Collection and management by the government
2. Collection and management by electricity suppliers and private companies

Q14 How old are you?

1 17 or under
2 18 to 24
3 25 to 34
4 35 to 44
5 45 to 54
6 55 to 64
7 65 and over

Q15 What is the highest grade or year of school that you have completed?

1 no school
2 grade school (1-8 years)
3 some high school (9-11 years)
4 completed high school (12 years)
5 some college but no degree (13-15 years)
6 associate degree
7 bachelor's degree
8 post graduate

Q16 And finally, regardless of your party identification, how would your rate your self politically. Very conservative, somewhat conservative, neither conservative nor liberal, somewhat liberal, or very liberal.

1 very conservative
2 somewhat conservative
3 neither conservative nor liberal
4 somewhat liberal
5 very liberal

Thank you very much for answering these few questions.

[FOR THOSE WHO INDICATED THEY WOULD LIKE A NEW SURVEY OR WOULD SEND IN A SURVEY THEY ALREADY HAVE]… We look forward to receiving all of your opinions in your completed mail survey. We really appreciate your participation in this brief survey.

Gender

Respondent gender:

1 male
2 female

Appendix G

Questions and Results from Contingent Valuation Surveys Not Otherwise Highlighted in Chapter 6

G.1 Select Warm-Up Questions and Results from CV Surveys

Question 3. Households in some states now have the option of choosing which company will provide their electricity (much like choosing a new long-distance telephone provider). Does your household have the option of choosing your electric company?

No	67.9%	n = 1565
Yes	19.9%	
Don't know	12.3%	

Question 4. In meeting the nation's overall electricity needs, please indicate how important each of the following issues is to you. *[5-point scale; 1=not at all important, 5= extremely important]*

	Mean Response
Ensuring that electricity service is reliable	4.74
Increasing the amount of electricity generated from renewable sources (such as wind and solar)	4.12
Minimizing the cost of electricity to consumers	4.52
Increasing investments in energy efficiency	4.27
Improving the quality of customer service	4.01

n= 1536-1553

Question 5. Electricity can be generated from many sources. In the United States, about 57% of our electricity comes from coal and oil, 22% from nuclear, 11% from natural gas, 8% from hydropower, and 2% from renewable energy. Even though producing electricity is less damaging to the environment than it used to be, electricity production still contributes significantly to urban smog, acid rain, and global warming. How much do you know about the environmental impacts of electricity production?

nothing 1	2	3	4	a lot 5	Mean Response
12.5%	25.3%	39.6%	16.1%	6.4%	2.79

n=1555

Question 6. There are several ways to reduce the environmental impacts of electricity production. Please indicate how important each of the following three approaches is to you.
[5-point scale; 1=not at all important, 5= extremely important]

	Mean Response
Energy Efficiency – reducing electricity use in homes and businesses by installing energy saving appliances and other measures	4.24
Pollution Control – reducing pollution at natural gas and coal plants by installing filters and other pollution control technologies	4.34
Renewable Energy – producing electricity with wind turbines, solar power, geothermal (heat from under the earth), and biomass (using wood and agricultural wastes to produce electricity)	4.22

n=1552-1557

Question 7. About 2% of the electricity produced in the United States comes from renewable energy sources, including wind turbines, solar power, geothermal, and biomass. Even though renewable energy often costs more than other ways of producing electricity, renewable energy has some benefits. How important to you are each of the possible benefits listed below?
[5-point scale; 1=not at all important, 5= extremely important]

How important is it to you that using renewable energy…	Mean Response
…may be less threatening to the environment than other ways of producing electricity	4.05
…reduces our dependence on any one type of electricity generation	4.00
…stimulates new technologies	3.98
…preserves the amount of natural gas and coal available for future generations	4.03
…can create new jobs	3.78

n=1533-1548

Question 8. There are also some possible drawbacks to using renewable energy. How worried are you about each of the possible drawbacks listed below?
[5-point scale; 1=not at all worried, 5= extremely worried]

How worried are you that renewable energy…	Mean Response
…could be more costly than other ways of reducing pollution	3.63
…may not be abundant enough for widespread use	3.47
…already receives too many subsidies	3.05
…could have some environmental drawbacks	3.34
…may not be available when we need it because the supply of some types of renewable energy can depend on the weather	3.66

n=1523-1556

G.2 Select Attitudinal Questions and Results from CV Surveys

Question 13. Please indicate how strongly you disagree or agree with each of the following statements. *[5-point scale; 1=strongly disagree, 5= strongly agree]*

n=1538-1551	Mean Response
I am often one of the first people I know to try new products	3.04
There is not much that any one individual can do about the environment	2.40
I am more likely to buy environmentally friendly products if I know that other people are doing the same	3.13
I don't trust the environmental claims of companies offering environmentally friendly products	3.16
I don't trust other people to make personal sacrifices to protect the environment	3.35
Now that companies are offering environmentally friendly products, we don't need as many environmental regulations	2.13
The government can't be trusted to collect funds and spend them on worthwhile causes	3.57
The government should require everyone to help pay for environmental improvements	3.13
I will only pay more for environmentally friendly products if I receive a direct benefit from doing so	3.18
I think my family and friends would support renewable energy if they had the option	3.59

Question 14. Which of the following actions do you and your household do on a regular basis?

n=1567	% Response
Try to buy products that are environmentally friendly	64.5%
Pay more for products that are environmentally friendly	22.9%
Recycle newspaper, metals, plastics, or glass	78.7%
Purchase organic foods	16.5%
Reduce energy use in the home	85.6%
Walk, ride a bike, carpool, or take mass transit to help the environment	23.3%
Donate money to environmental causes	16.2%
Volunteer time to environmental causes	5.2%
Invest money in companies that are socially responsible	11.5%
Write letters to politicians about environmental issues	5.0%
Weigh candidates' environmental records when deciding who to vote for	41.5%

Question 15. How much do you think individuals like yourself can do about the following?
Question 16. How much do you think government programs and regulations can do about the following? *[4-point response; 1=nothing, 4=a lot]*

n=1518-1561	Mean Response Individual	Mean Response Government
reducing litter in public places	3.58	3.06
decreasing the amount of solid waste in landfills	3.04	3.21
decreasing air pollution that produces smog	2.75	3.35
lessening the destruction of the ozone layer	2.59	3.13
increasing the amount of renewable energy used	2.67	3.31
reducing the threat of global warming	2.37	2.99
reducing the loss of wilderness areas	2.71	3.44